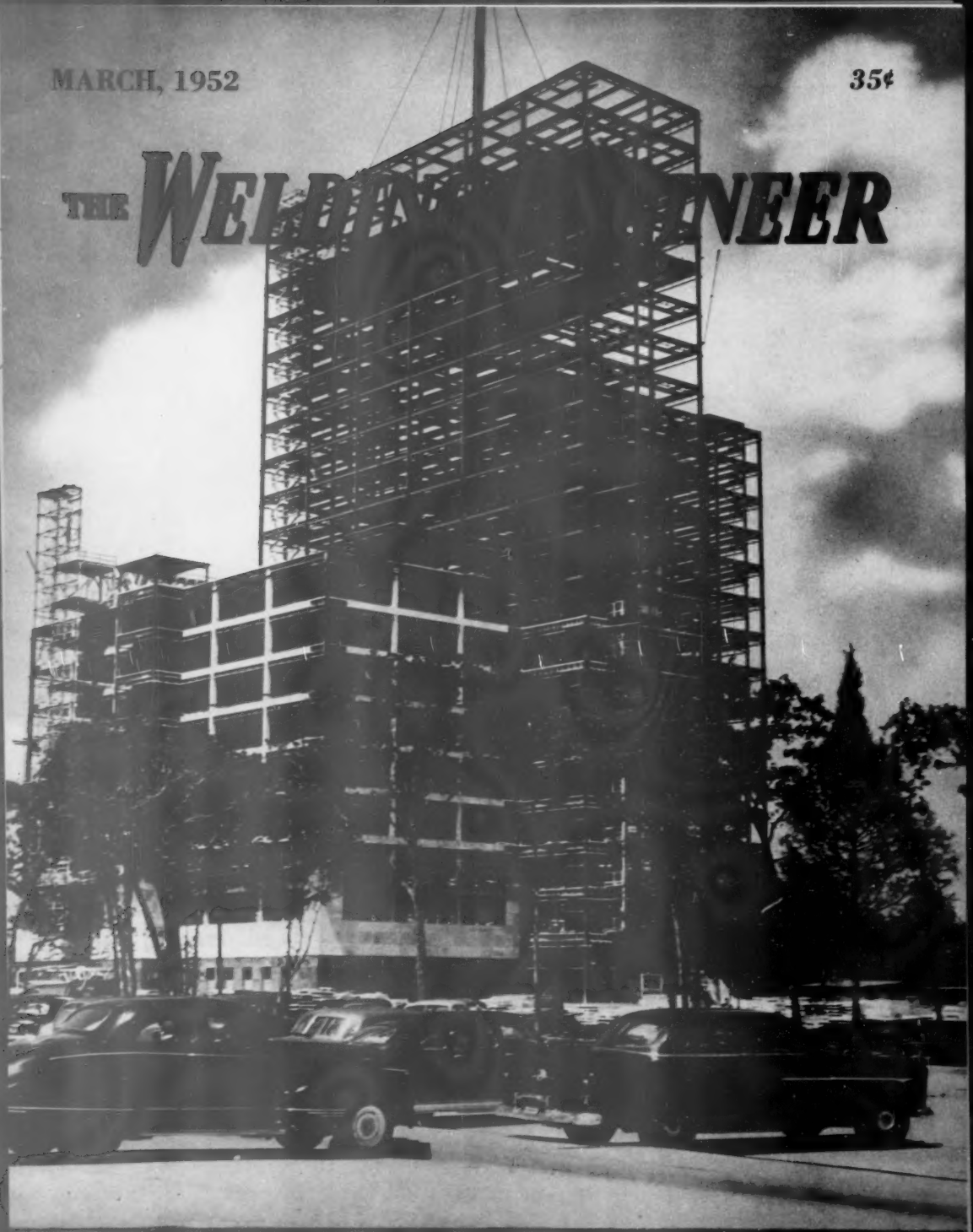
MARCH, 1952

35¢

THE WELDING ENGINEER



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MARCH, 1952

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To replace, cover glass slides out without disturbing the filter lens

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NEWS FROM WASHINGTON

Non-Nickel-Bearing Stainless off CMP

CHROME STEEL that does not bear nickel is off the CMP list. The removal marks NPA's first action in this direction since the setting up of the Controlled Materials Plan. Under its new status, consumers need no longer obtain CMP-4B "tickets" to entitle them to purchase the chrome-iron alloys, which are, in effect, restored to the free market.

The reason for the removal was the abundance—in fact, over-abundance—of chromium alloys. Toward the end of 1951, federal metal rationeers were going around begging for more applications of chrome steel under CMP and couldn't get enough takers. They hope that the decontrol will boost future demands.

Nickel-bearing or austenitic stainless is not affected by the decontrol order, it is emphasized. Nickel is in very tight supply because of huge defense demands that show no signs of easing.

Air Force Aluminum Will Be Kept for CMP

LAST MONTH the Air Force decided it would not need its full aluminum allocation for the second quarter. A lot of people became hopeful of sharing the 20-million-pound pie, but DPA-Chief Fleischmann quickly announced that not more than 10 to 15% would be reallocated. Instead, the unused portion will be used to help work off the tremendous backlog of "ration tickets" issued by NPA for aluminum above and beyond the amount producers can be expected to supply. Fleischmann predicts "no widespread relief from metals shortages . . . during 1952."

One beneficiary of the aluminum jackpot is the auto industry, which has been granted an extra million pounds of the metal for second quarter production—half of what it had asked for.

Effective last January 23rd, NPA amended Order M-5, its basic aluminum order, to insure that all holders of CMP allotments for that metal would get their orders placed on mill schedules in the second quarter.

Continued Tungsten Allocation Recommended

DESPITE reports that the industry's position with respect to available supplies is improving, the Tungsten and Molybdenum Wire and Rod IAC has recommended that allocation of these metals be continued to assure equitable distribution.

This course of action may come as something of a disappointment to users of inert-arc welding, who would probably be happy to see some unallocated tungsten around. The recommendation that it be followed seems to be based, in part, on a "let well enough alone" theory since, according to the Committee, customers' orders are currently being held in fairly good balance with authorized production schedules. There seems also to be some likelihood that military requirements will increase, and that the demand for tungsten as a ferro-alloy will grow in the coming year.

Sharp Rise over 1951 in Industrial Building

INDUSTRIAL building this year looks very good. Privately financed work amounting to $179 million was put in place in January. This represents an increase of 39% over last year's level. For the same period, public industrial building, at $83 million, showed an increase of 131%. Private residential building, however, was 20% below the level of a year ago, as were public works (highways, hospitals, institutions, sewers, etc.), while commercial building was down more than 26%.

With this as a background, you can look for some relaxation in government restrictions on commercial building and on some types of public construction, such as highways, because cutbacks have brought hardships as well as unemployment.

DTA Tells 1952 "Tank Car Story"

DEFENSE Transport Administration has issued a definitive study of the tank-car situation. This official DTA "Tank Car Story" tells why there are 9,182 tank cars on order from car builders, undelivered, as of Nov. 1, 1951, and more are to be ordered. The expansion in production is emphasized by the fact that during ten months of 1951 a total of 5,056 new tank cars were delivered, as compared to 1,684 in the year 1950.

These cars are about evenly divided between those for petroleum and for non-petroleum service. Looking ahead, DTA says that there will probably be enough general-purpose cars for overall clean petroleum service if cars on order are constructed as scheduled. However, at peak periods there will be some shortages of cars for asphalt in the summer and for fuel in the winter.

The construction of chemical cars is behind schedule because of the shortage of steel; a few spot shortages have resulted because of this delayed production.

Copies of the DTA "Tank Car Story" (DTA release 155) are available at the offices of the Defense Transport Administration, ICC Building, Washington 25, D. C.

Small Business Tax Guide Released

FOR SMALL business operators who need help with their tax problems (And who doesn't?), the Department of Commerce has issued a bulletin, "Basic Tax Information for Small Business."

Among the questions discussed are: Federal income taxes upon business owners as individuals and upon corporations; withholding of Federal income tax and social

security payments from the wages of employees; important recent changes in the Social Security Act; Federal excess profits, manufacturers' excise, retailers' excise and occupational taxes; and Federal license fees.

Other sections of the bulletin deal with state taxes including property, sales and use taxes; licenses; unemployment compensation, and state income taxes. Local taxes, such as those on property or on business and professions are also discussed.

For a copy of the bulletin, address: Division of Printing Services, U. S. Department of Commerce, Washington, D. C.

Permanent Rules for Contract Renegotiation

PERMANENT renegotiation rules designed to eliminate excessive profits from defense contracts have been issued by the Renegotiation Board to replace the tentative rules that were issued in January. The rules eliminate fixed formulas; instead "reasonable profits" are to be decided on the merits of each case.

Independent regional offices work directly with contractors and subcontractors supplying the armed forces and civilian government agencies subject to the 1951 Renegotiation Act. All four regional offices of the Renegotiation Board, in New York, Chicago, Washington and Los Angeles, are already in operation.

Minimum Plate Gage Would Mean Welding

A PROPOSAL for a limitation order to set minimum gages of plate to be produced by certain sheared mills was requested of NPA by a group of producers of heavy plate. Such a limitation would conserve capacity and improve productivity in wide and heavy plate, the producers feel.

Customers who ordinarily buy lightweight plate from the big sheared plate mills would place their orders with strip mills under the proposed set-up. The plates would then have to be welded to the required sizes.

NPA expects plate production for the second quarter of this year to be almost double the rate set for the first eight months of 1951.

NPA Metal Reserve for Small Business

TO HELP small manufacturers of civilian goods who have been hard hit by cutbacks in their metal rations, NPA has set up a "Small Business Hardship Account." This amounts to a limited but substantial reservoir of CMP metals to be parcelled out to small firms that would otherwise be faced with shutdowns because they have received insufficient controlled materials. It is a supplement to, not a substitute for, their normal quarterly allocations.

To qualify for a supplement from the "Hardship Account," the manufacturing firm must first be classified as a "small business" according to Department of Commerce definition. It must produce a single line of goods, and must be so hard up for controlled materials that failure to get a supplement would result in "failure or prolonged shutdown." Furthermore, it must be unable to convert to defense production without either a heavy investment or extensive retooling.

Small businesses that do not qualify for help from this special fund may, of course, continue to file supplemental applications for other previously available forms of relief under the CMP system.

Contracts Need Not Go to the Lowest Bidder

A NEW POLICY on defense contracts whereby small firms may be able to get the jobs even when they bid higher than their big competitors is in the making. Telford Taylor, head of the Small Defense Plants Administration, reports that the Administration is drawing up directions for government procurement officers to follow that would allow small business men to win awards on defense orders even though the bids submitted are as much as 15% above those of the lowest big bidder.

This is in line with the thinking of Comptroller General Warren, who ruled recently that advertised defense contracts need not be let to the lowest bidder.

Apply in Triplicate for Priorities Aid

USE OF CARBON paper is due for a sharp upswing as a result of NPA's recent announcement of a new method to be followed by applicants who seek assistance in priorities, materials or other matters. Henceforth, all such applications are to be made in triplicate.

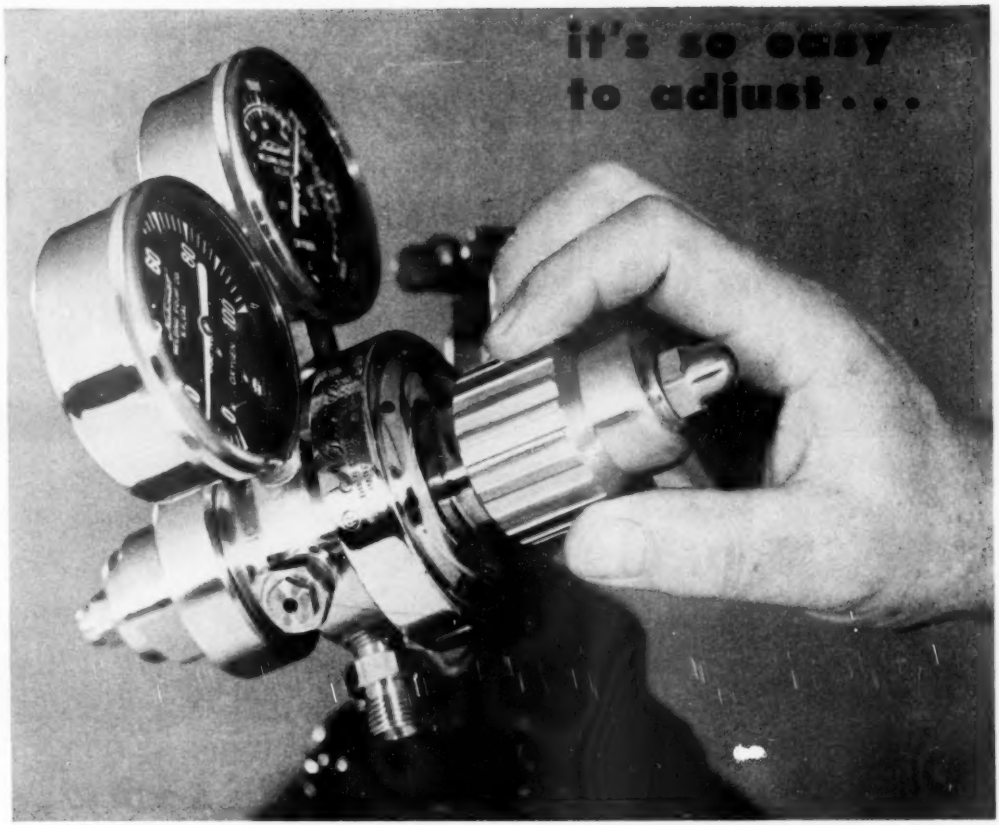
The two extra carbons, says NPA, will provide enough copies to reach all the bureaus and divisions concerned. This is expected to result in a saving of two to ten days in the processing of each request.

Another timesaver suggested by NPA is the use of an approved form in place of a letter. Form NPA-132, "Application for Adjustment or Exception," provides a convenient means for advising applicants of the information NPA needs.

Defense Contract Termination Method

A NEW SECTION, "Termination of Contracts," has been issued by the Munitions Board as an addition to its regulations for settling military contracts. This section will create uniform procedures for termination of contracts with the Army, Navy and Air Force. These uniform procedures, established for the first time since 1948, will apply to all future contracts and can be made to apply to existing contracts if these are suitably amended.

Copies are available for 50c each from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Ask for Section VIII: "Termination of Contracts."



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A UNIT WITH MANY APPLICATIONS!

The new Westinghouse Engine-Driven Welder was developed for construction and field-maintenance operations. It provides 200 amperes of d-c current for welding. It also provides 3,000-watt, 110-volt, a-c current for stand-by power. By simply plugging into convenient receptacles on the a-c power panel, the operator may obtain power for drills, grinders, pumps, lights and other electrical equipment.

The standard unit is skid mounted for truck transport or may be mounted on a high-speed, pneumatic-tired trailer. Ready for field service, the unit weighs only 1,150 pounds and measures 39½″ high by 62⅝″ long in the stationary model.

The standard model has hand-crank start. Battery start is also available.

A large toolbox for storing cables, helmets, electrodes, tools and other accessories is also included if desired.

FOR MORE INFORMATION

Write to the Westinghouse Electric Corporation, Welding Division, Buffalo, New York, or contact your nearest Westinghouse representative. J-21611

welder PLUS stand-by power!

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Closely coupled to the driving engine, this new improved generator makes it easier to strike and maintain a steady welding arc. No exciter is required. Welding current ranges from 40 amperes at 20-load volts to 250 amperes at 40-load volts.

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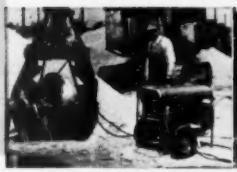

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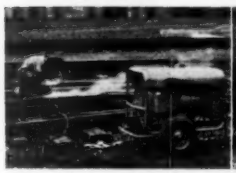

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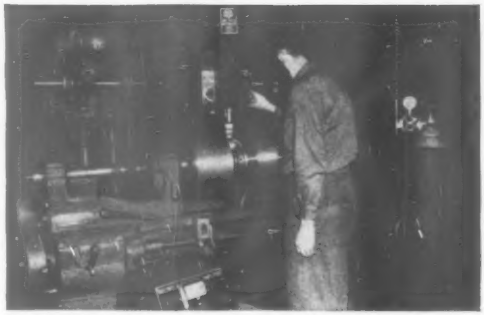
Completed Breathing oxygen cylinders.



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Companion-piece of the Heliweld Automatic Head, this jig-mounted manual, water-cooled Heliweld Holder fastens outlet spuds at the rate of nearly two hundred a day to begin the production run of oxygen breathing cylinders for D. K. Manufacturing Co.

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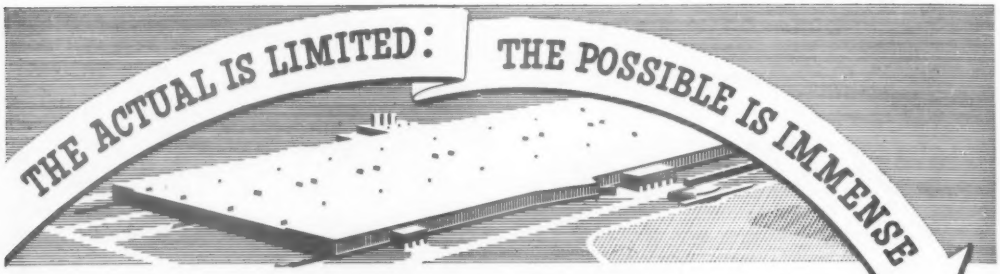

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT . . . cuts costs for Hanson-Van Winkle-Munning

THE examples show how one prominent manufacturer has improved the quality of his products while cutting costs by converting to welded steel design.

When designing for efficient welded steel construction, savings in initial material cost alone generally average 85% to 95%. This is because steel costs less per pound. And with steel's greater strength and rigidity, fewer pounds of metal are needed. In many cases, machining operations required for iron can be minimized or eliminated entirely.

Where product designs utilize the economies of welded steel, cost analyses show that:

1. Material costs for steel generally range from 5% to 15% as compared with castings.
2. Labor costs for fabricating steel are about 30% of initial casting purchase costs.
3. Welding costs average 50% of total labor costs for fabricating steel.

If your costs do not approximate these averages, your product designs should be reappraised. A Lincoln Welding Engineer will gladly point out what benefits of welded steel may have been overlooked.

Inquire about the "Weldesign Training Course" for your engineers, designers and production men.

Fig. 3. Welded steel *saves 30% cost . . . cuts weight 50%. Design is simpler . . . plain channel replaces complicated casting.*

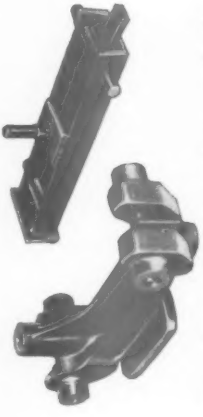

Fig. 4. Stronger, more rugged machine part *results when fabricated from steel strip and standard channel. Weight is cut from 3 lbs. to 2 lbs. 4 oz. Cost of this small part is 12% less.*

ORIGINAL CONSTRUCTION

Fig. 1. Machine bracket *for* Hanson-Van Winkle-Munning, *Matawan, N.J. weighed 50% more than present steel design. Casting had to be left heavy for strength in hub and arm. Design made efficient use of cast iron by providing cored slots. Casting required milling and drilling.*

PRESENT WELDED STEEL DESIGN

Fig. 2. Finished weldment *costs 25% less . . . eliminates former breakage experienced in casting. Steel hub, cut from bar stock and pre-drilled, is welded to simple formed steel arm in which holes are pre-punched.*

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ESTABLISHED 1916

THE WELDING ENGINEER

MARCH, 1952

Your Right to Work

THE ONE RIGHT of every American that is absolutely basic is his right to a job of his own choice. Take away that right, and we might as well live in Soviet Russia and be done with it.

That basic right is being undermined by a powerful combine of interests opposed to the American way of life. Little by little, they are gnawing away at it, just as rocks standing at the ocean's edge are eroded a little more each year under the constant attack of the sea.

The sinister interests wouldn't have a chance, of course, if the American public was really aware of what they were doing. But most people are not.

In his new book, *Incentive Management*, James Finney Lincoln offers a big dollar's worth of ideas. Mr. Lincoln is not exactly unknown to readers of this page as he is the president of The Lincoln Electric Co., Cleveland. The solution he gives for ending the "war" between management and labor has proved wholly workable in Mr. Lincoln's own plant. His conclusion is:

"The American economy must adopt incentive management. We cannot afford to let the outmoded plan of labor-management civil war continue."

Many of Mr. Lincoln's thoughts will prove to be "fighting words" and will no doubt arouse fierce denunciations of his book. For instance:

"America cannot allow the benighted leadership of government and labor unions to throttle progress. We cannot allow selfish politicians to build up labor-union power that has for its only purpose the condemning of all Americans to be 'common men' without hope, without pride and without opportunity to be self-respecting individuals."

RIGHT NOW, every working person in America is in danger of being subjected to the very conditions Mr. Lincoln bemoans. Washington Emergency Board No. 98, appointed by the President under the Railway Labor Act, is preparing to answer the question: "Shall the force of government be imposed to enforce the union shop?"

Labor unions, naturally, say the answer should be Yes. I say No, not because I have any quarrel with labor unions, but because I feel that a government that forces union membership upon a citizen is interfering with our fundamental American right: freedom of choice of employment.

EVEN the late President Roosevelt, a powerful friend of labor, would not go as far as that. During the last war, he told John L. Lewis:

"The government of the United States will not order nor will Congress pass legislation ordering a so-called closed shop. That would be too much like the Hitler method toward labor."

The same persons who advocate that everyone should be forced to join a union would be the loudest to protest if told that they would have to join the Methodist church or starve. Yet the principle is exactly the same.

Union labor now represents about one-fourth of America's total number of workers. Its growth has not kept pace with the country's working force: union membership has practically stood still during the past five years while the number of workers has increased by about nine million. Does this aggressive minority have the right to force an apparently reluctant majority to obey its dictates?

The closed shop has often been a deterrent to technological progress. In the building trades, where union membership is practically compulsory, the tools of construction remain the hammer and saw, the hod and the trowel, pretty much as they were during Grandpa's younger days. As a result, a new home is so costly that the average family can't afford even the "cheapest" variety.

But worse than that is the principle involved. The government of the United States has fallen low indeed when it makes itself a party to a transaction that will deprive a man of his livelihood unless he joins a particular union.

If you feel that government should not order a union shop, write to your congressmen and tell them so. Also write to the Public Members and the Industry Members, separately, of the Wage Stabilization Board, Washington, D. C., and tell them what you think about it. And tell your neighbors to write.

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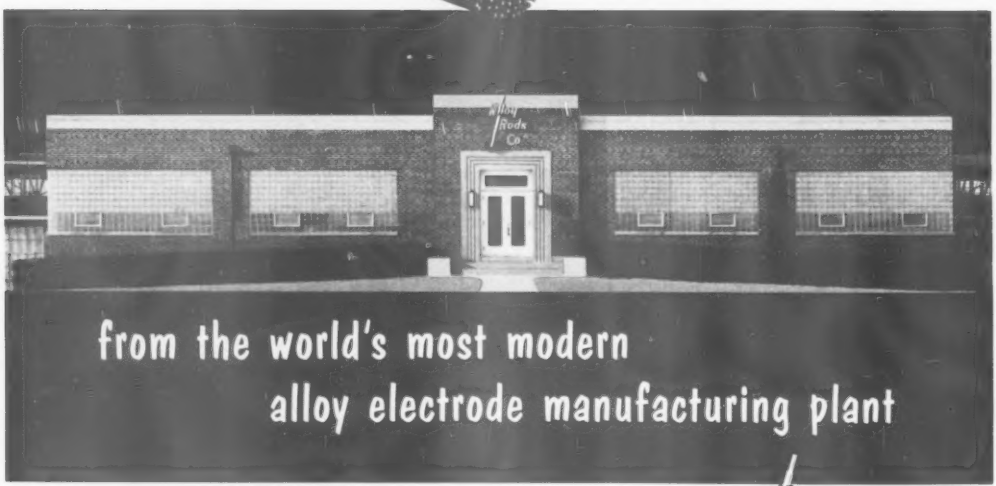

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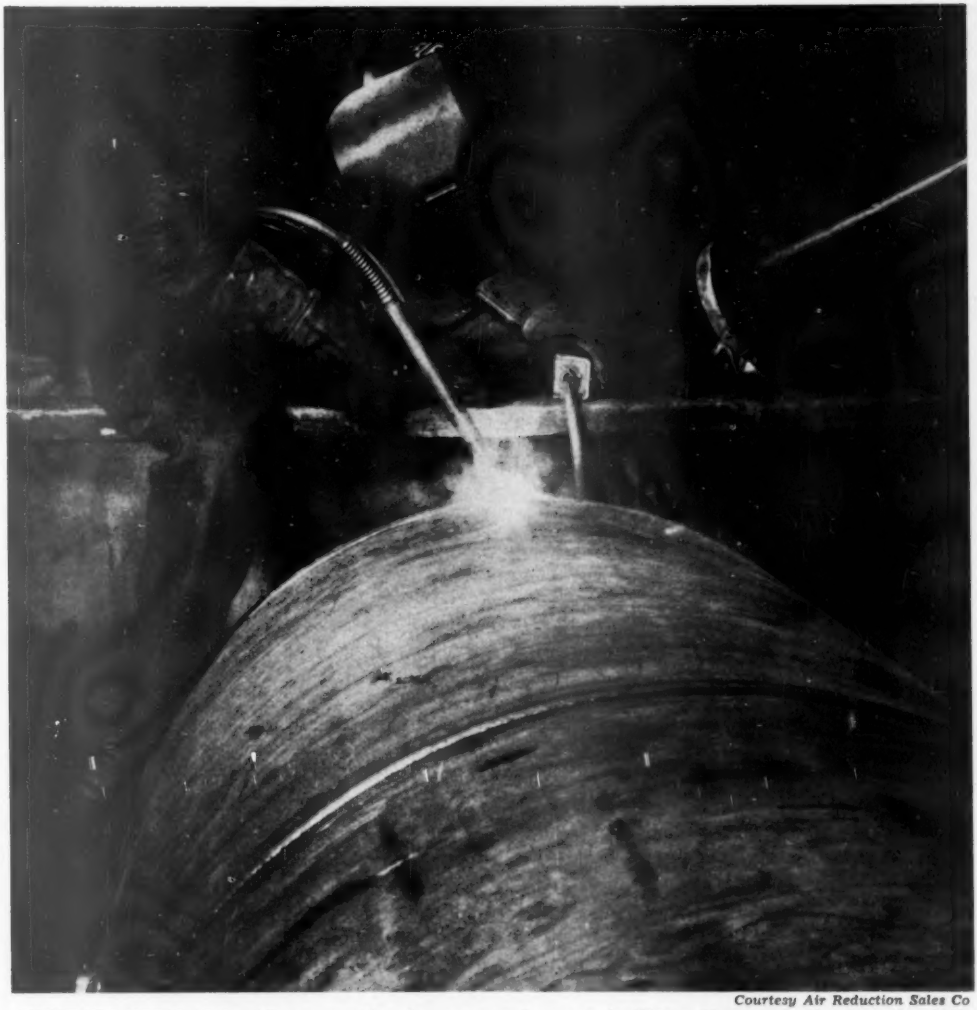


Courtesy Air Reduction Sales Co

INERT-ARC METAL-ARC welding on a silicon-bronze water heater tank. This weld joins the head to the shell

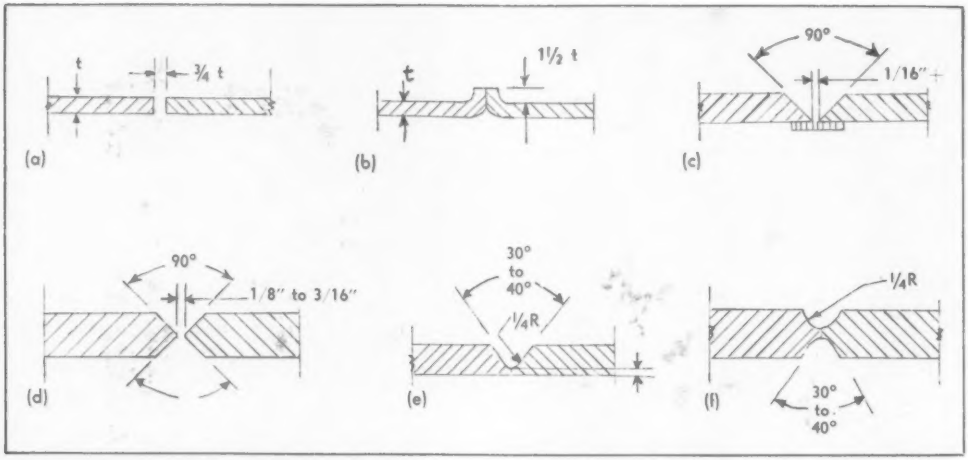
Welding Procedures for Copper-Base Alloys

BY LESTER F. SPENCER

Chief Metallurgist, Landers Frary & Clark, New Britain, Conn.

To weld tough-pitch copper is a tough pitch, but deoxidized copper isn't so bad. Why not? Do you know why the high brasses can cause more welding trouble than the low brasses? Maybe you had better read this article.

COPPER *is one of the friendliest of the metals. It alloys with at least thirty (about a third) of its fellow elements, and seventeen of these unions result in commercial copper alloys. Since each alloying element may be blended with copper in varying proportions, the number of one-element alloys can become staggeringly large.* *(Next page.)*



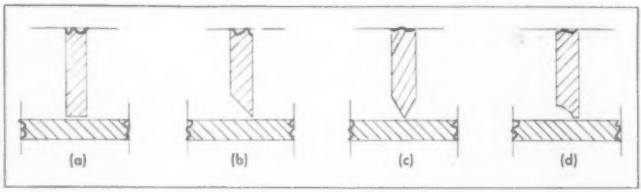
1—BUTT-joint designs for copper-base alloys: (a) is a square butt joint; (b) an upturned butt joint; (c) a single-vee joint; (d) a double-vee joint. The single-U and double-U joints (e and f) are used only for heavy plates

Copper alloys need not be (and are not) restricted to copper and one other element. Three, four and even five elements are used, again in varying proportions.

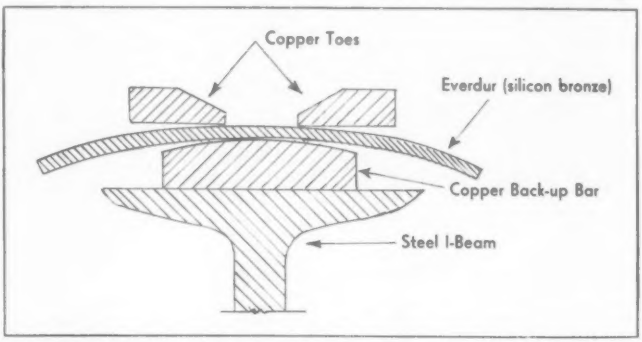
Fortunately for sanity, the enormous number of copper-bearing materials may be classified for welding purposes into a few basic groups: copper itself, beryllium copper, brasses, tin bronzes, aluminum bronzes, copper-nickel alloys, etc. Even with this clue to follow, however, it's a tough task to find your way through the complications of the copper alloys. That's why Lester Spencer is to be congratulated for his excellent job of boiling down an enormous mass of facts into a form where they can be swallowed and digested.

THE WELDING ENGINEER *will publish Mr. Spencer's "Welding Procedures for the Copper-Base Alloys" in two parts. The present installment will cover preliminary considerations such as joint preparation, back-up bars, etc. and go on to the fusion welding of pure copper, beryllium copper and the copper-zinc alloys. Part two, to be published in our April issue, will discuss fusion welding methods for the various bronzes and resistance-welding methods for all of the copper-base alloys.*

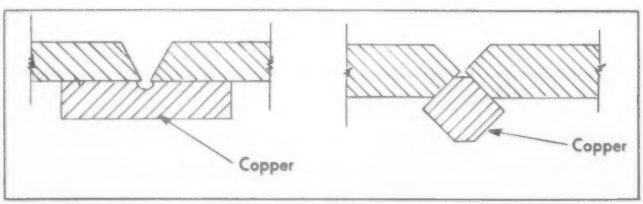
We think that Mr. Spencer has made a valuable and permanent contribution to welding literature. We know that you will want to read his articles and probably file them for future reference—THE EDITORS.



2—FILLET joints used for the copper-base materials: (a) is a plain fillet; (b) single-vee T-joint; (c) double-vee T-joint and (d) single-U T-joint



3—BACK-UP bar and clamping toes for welding of a thin Everdur sheet



4—OTHER types of back-up bars used to weld the copper-base materials

All of the common welding procedures are employed in the joining of copper and the copper-base alloys as a group; however, all methods are not suitable for any one alloy or metal. The choice of welding procedure depends upon such factors as: *(a)* the extent of corrosion resistance desired in the weldment; *(b)* the size and design of the weldment; *(c)* the available welding and jigging equipment and *(d)* the characteristics of the various welding methods in relationship to both the metallurgical and physical properties of the metal or alloy joined.

As compared to steel, the copper-base alloys have higher thermal and electrical conductivity, higher coefficients of thermal expansion, lower melting points and greater fluidity at welding temperatures. These differences necessitate a different technique from that employed in the welding of steel. Thus, it is usually necessary to observe the following precautions[1]: (1) an allowance of more space in the joint for expansion: (2) the more frequent use of tack-welding procedures; (3) the use of higher preheats; (4) the use of higher amperage for the size of electrode and plate thickness and (5) the use of a faster traveling speed than that normally used in the welding of mild steel.

When resistance-welding procedures are employed, the following conclusions can be drawn in the weldability of this class of material[2]: (1) the electrical or thermal conductivity is a good gage in inverse ratio of relative weldability and is also a gage of the secondary current required; (2) the welding pressures are somewhat lighter than those employed for mild steel; in the welding of the high brasses, the pressures are considerably lighter; (3) welding time is shorter.

Welding machines used to join the copper-base alloys should have pressure systems built for a quick follow-up as the weld melts. This means a low inertia and a low mechanical friction. The welding time is shorter than that employed for mild steel but comparable to values for the welding of stainless steels.

Joints for Fusion Welding

One of the important considerations in the fusion welding of the copper-base alloys is to find the type of joint that will serve the intended purpose and do it economically. The selection of the joint will depend upon such factors as the type and characteristics of the applied loading on the joint; method of application of load, and the combined costs of joint preparation and welding. A few of the more commonly used butt joints are illustrated in Fig. 1. The square butt joint and the upturned butt joint, as indicated by *(a)* and *(b)*, are satisfactory for thicknesses of from 1/32 to 1/8 in. when the welding can be performed in one pass. These joints are inexpensive and are usually suitable for the load conditions if full penetration is secured.

The single-vee joint *(c)* is used on gages over 1/8 in. to an upper limit of approximately 7/16 in. Joint preparation costs are higher, and greater electrode consumption is realized. Bevels may be either 45 or 37½ deg. The root opening will vary in accordance to the thickness of plate to be welded and may range from 1/16 to 3/16 inches.

The double-vee joint *(d)* and the single and double U-joints *(e* and *f)* are used for the welding of the heavier gages, usually over ¾ in. The included angle between the joint may vary; however, the angle is more liberal than that employed in the fusion welding of mild steel. A wider angle is necessary in order to eliminate undercutting and possible slag entrapment and porosity in the fusion zone.

Fillet types of joints are pictured in Fig. 2; these include the plain fillet *(a)*; single-vee T-joint *(b)*, the double-vee T-joint *(c)* and the single-U T-joint *(d)*. Such joints are employed in the order given for increasing thicknesses of material. Edge, corner and lap joints are also used in the welding of the copper-base alloys.

Where the heavier gages of material are involved, multipass welding is practiced on nearly all the copper-base alloys. Particular care should be taken to chip out each pass so that the weld layer will be free from slag or weld defects before the next bead is laid. This cannot be stressed too greatly. Thus, in the carbon-arc welding of the high brass compositions, all crater cracks that occur at all stops should be chipped, particularly if low-fuming bronze welding rods are employed. It is normally advisable to weld a joint with as few stops and starts as possible; however, if stops are apt to occur, it is best to start in back of the last stop. Certain precautions should be followed in the welding of the copper-base alloys, as mentioned within the text.

Use a Back-up Bar

Successful welding is often dictated by the type of back-up bar. The use of a high-conductivity material such as electrolytic copper is often recommended; its chill-mold effect assures the production of a clean, smooth weld surface. Figure 3 illustrates the use of a copper back-up bar with clamping toes in the welding of a thin-gage silicon-bronze sheet. Figure 4 shows two other procedures where a copper back-up bar can assure full penetration of weld metal. These illustrations are based on sketches in a booklet, "Anaconda Welding Rods and Procedures," published by the American Brass Co., Waterbury, Conn.

A number of the more commonly used copper-base materials are tabulated in Table I.

Generally, the welding rod or electrode used to join a copper-base alloy is quite similar to the base composition; however, there are modifications and deviations where a specific property is involved. Thus, an aluminum-bronze coated rod is preferred in the metal-arc welding of the brass compositions, due to the fact that the resultant deposit has excellent corrosion resistance. Also, the choice of welding rod may be influenced by the composition of the parts being joined, whether similar or dissimilar, etc.

Any particular question on either the type of rod, electrode diameter, etc. should be put up to the supplier of the electrode material; the selection being made on the facts of the specific problem. A partial listing of electrode materials, available forms and suggested uses is given in Table II.

Because of the highly refractory nature of the oxides of tin, aluminum, beryllium and nickel, the use of a powerful fluxing agent, either in the form of a coating or manually applied, is a prime requisite in welding these alloys. These refractory oxides are quite difficult to remove once they have formed. Hence, in many instances, the fluxing agent will contain fluoride compounds to inhibit the formation of oxides.

Table I. Nominal Compositions of Major Copper Alloys

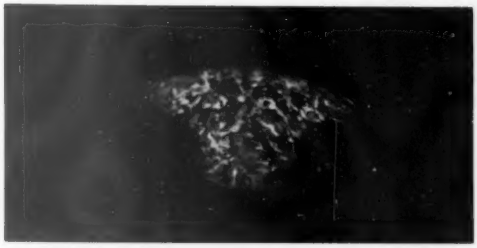
	Chemical Composition, Percent							
	Copper	Zinc	Silicon	Manganese	Tin	Phosphorous	Nickel	Other Alloys
Elec. Tough-Pitch Copper	99.9*							
Deox. Copper (Low Phos.)	99.9*					0.004/0.012		
Deox. Copper (High Phos.)	99.9*					0.015/0.04		
Red Brass	85.0	15.0						
Silicon Brass	77.0	22.0	1.0					
Silicon Brass	70.0	29.5	0.5					
High Brass	65.0	35.0						
Manganese Brass	66.0	33.0		1.0				
Naval Brass	60.0	39.25			0.75			
Muntz Metal	60.0	40.0						
Manganese Bronze	58.5	39.2		0.3	1.0			Iron — 1.0
Silicon Bronze, Type A	94.8	1.5**	3.0	1.5**	0.75**		0.6**	Iron — 1.6**
Silicon Bronze, Type B	96.0	1.5**	1.5	0.75**	1.6**			Iron — 0.8**
Silicon Bronze, Type C	91.0	4.5**	2.5	1.25**			0.6**	Iron — 0.8**
Phosphor Bronze, Grade A	94.0*				5.0	0.03/0.35		
Phosphor Bronze, Grade C	90.5*				8.0	0.03/0.35		
Phosphor Bronze, Grade D	88.5*				10.0	0.07/0.25		
Phosphor Bronze, Grade E	98.5*				1.25	Trace		
Aluminum Bronze, 5%	95.0							Aluminum — 5.0
Aluminum Bronze, 8%	92.0							Aluminum — 8.0
Aluminum Bronze, 10%	90.0							Aluminum — 10.0
Aluminum Bronze, 10%	82.5						5.0	Alum. — 10.0; iron 2.5
Cupro-Nickel, 20%	80.0						20.0	
Cupro-Nickel, 30%	70.0						30.0	
Nickel Silver, 18%	55.0	27.0					18.0	
Beryllium Copper	97.75						0.35	Beryllium — 2.0; cobalt — 0.25 — may replace Ni.

*Minimum **Maximum

Table II. Copper and Copper-Alloy Electrode Classifications

Core Wire Type	Proposed AWS — ASTM Designation	Deposit Composition, %	Available Form	Application
Deoxidized Copper	E Cu	Copper — 99.0	Coated and bare	Oxyacetylene, metal-arc and inert-arc welding of deoxidized copper.
Phosphor Bronzes	E Cu Sn-A	Tin — 5.0 Phosphorous — 0.3*	Coated and bare	Metal-arc welding of deoxidized copper, low and high brass, phosphor bronze; carbon-arc welding of phosphor bronze and copper.
	E Cu Sn-C	Tin — 8.0 Phosphorous — 0.3*	Coated and bare	Carbon-arc welding of electrolytic tough-pitch copper, deoxidized copper for single-pass welding; metal-arc welding of phosphor bronze.
	E Cu Sn-D	Tin — 10.0 Phosphorous — 0.3*	Coated and bare	Carbon-arc welding of electrolytic tough-pitch copper, low brass for single-pass welding, phosphor bronze; oxyacetylene welding of phosphor bronze.
Silicon Bronze	E Cu Si	Silicon — 3.0 Copper — 94.0**	Coated and bare	Carbon-arc welding of deoxidized copper, low and high brasses, silicon bronze; metal-arc welding of deoxidized copper and silicon bronze; inert-arc welding of deoxidized copper, low and high brasses, silicon bronze, phosphor bronze and cupro-nickel; oxyacetylene welding of deoxidized copper, silicon bronze and low brass.
Aluminum Bronzes	E Cu Al-A	Aluminum — 7.5/9.0 Iron — 1.5*.	Coated	All procedures in welding aluminum bronze; metal-arc welding of the brasses.
	E Cu Al-B	Aluminum — 9.0/10.0 Iron — 3.0/5.0	Coated	All procedures in welding aluminum bronzes.
	E Cu Al-C	Aluminum — 10.0/11.0 Iron — 3.0/5.0	Coated	All procedures in welding aluminum bronzes.
	E Cu Al-D	Aluminum — 11.0/12.0 Iron — 3.0/5.0	Coated	All procedures in welding aluminum bronzes.
	E Cu Al-E	Aluminum — 12.0/13.0 Iron — 3.0/5.0	Coated	All procedures in welding aluminum bronzes.
Cupro-Nickel	E Cu Ni	Nickel — 30.0		Metal-arc, inert-arc and oxyacetylene welding of the cupro-nickels.

*Maximum **Minimum Note: Remainder copper unless otherwise specified.



5—BUTT WELD in deoxidized copper made by inert-arc metal-arc process using a deoxidized-copper wire

6—SAME parent metal, same process, but the wire was silicon bronze and two passes were made in the joint

Photos courtesy Air Reduction Sales Co.

Electrolytic tough-pitch copper is 99.9% (minimum) pure copper. Even the small amount of cuprous oxide it contains, however, is enough to cause trouble in welding operations involving temperatures above 1,300 F. Heating above this temperature redistributes the cuprous oxide phase, which considerably lowers joint strength; the strength may vary from 50 to 70% of the strength exhibited by the annealed base metal, depending upon the type and conditions of the fusion welding process.

The degree of embrittlement is a direct function of time at the welding heat; the shorter the time at the fusion temperature, the less harmful will be the redistribution of cuprous oxide.

Welding Tough-Pitch Copper

Where slight reduction in strength is not too objectionable, carbon-arc welding is often employed, providing that high rates of progression (10 to 20 ipm) can be attained without preheating[3]. The rapid welding speed minimizes migration of cuprous oxide to the grain boundaries. In addition, it is recommended[3, 4, 5] that the fluid phosphor-bronze filler rod be employed and used in conjunction with a long arc[3] to minimize porosity. No flux is required with these welding rods. It is not practicable to utilize the carbon-arc welding procedure on thickness over ⅜ in. and its use in lighter gages is generally limited to flat welding procedures.

The copper-silicon welding rods are not recommended because their lower welding speeds will permit more reduction of the cuprous oxide phase. With the carbon-arc process, a backing is usually employed to eliminate burning through and a graphitic type of electrode sharpened to a long tapered point is recommended[3]; the carbon should be at least equal to the size of the welding rod and preferably larger.

Metal-arc and oxyacetylene procedures are not recommended for tough-pitch copper because of the previously mentioned loss in joint strengths. Wherever joint strength is of primary importance, use either a silver brazing or phos-copper brazing technique.

When copper has been deoxidized by the addition of a very small percentage of phosphorous, all fusion welding processes may be employed without loss of strength within the joint. Multipass welding procedures will permit the joining of the material in all thicknesses. The high thermal conductivity of copper necessitates the use of preheat and interpass temperatures of from 800-1,000 F, this being especially necessary for the heavier sections.

In carbon-arc welding of deoxidized copper, the copper-silicon welding rods have proved most successful because of their ability to withstand the high heats of welding and their ease in control of the weld metal. Fluxing with this type of electrode is highly desirable. The 5% phosphor-bronze welding electrode is also used since the deposit approaches that of copper in both color and physical properties. Fluxing with this type of electrode is not necessary. However, multipass welding is not recommended[5] with this type of electrode; the thickness limitation is approximately ⅜ in. Downhand welding should be employed and the use of a backing plate is highly recommended.

Both the phosphor-bronze and the silicon-bronze electrodes are employed in either metal-arc or oxyacetylene procedures; however, a deoxidized-copper electrode is preferred where the weld joint requires either good corrosion resistance or a high thermal and/or electrical conductivity. A preheat is usually required, and in metal-arc welding, the largest electrode diameter permissible (along with high amperage) is essential to avoid undercutting and possible slag inclusions. The joints may be restrained moderately by clamping if not too tight; tight clamping may cause the joint to crack.

The inert-arc welding process can be used for deoxidized copper up to plate thicknesses of ½ in. A bare welding rod of copper alloyed with small amounts of silicon, manganese and tin will give[5] weld strengths ranging from 29,000 to 30,000 psi and sufficient ductility to permit a weld in ½-in. plate to be bent 180 deg. The copper-silicon rod can also be employed, using either argon or helium as the shielding gas.

Figures 5 and 6 are macro-etchings of a butt weld as produced by the inert-arc metal-arc welding process. In both cases the parent metal was ¼-in. deoxidized copper and the shielding gas was argon flowing at a rate of 45 cfh. For the joint illustrated in Fig. 5, the electrode was a 3/32-in. deoxidized-copper wire traveling at a speed of 17 ipm. The current value was 450 amp and the joint was made in a single pass. In Fig. 6, the electrode was a 1/16-in. silicon-bronze rod, and two passes were required to complete the joint.

Beryllium Copper

The commercial product known as beryllium copper is 97.75% pure copper, alloyed with only 2% beryllium and a small amount of either nickel or cobalt (see Table I). The carbon-arc method is the preferred method of fusion welding, though the

metal-arc process is also employed. The refractory nature of the beryllium oxide necessitates protection by fluoride-containing flux, used either as a wash or as an electrode coating. Beryllium copper can also be successfully welded by the inert-arc process, but it is rarely welded by the oxyacetylene torch.

In both metal-arc and carbon-arc welding, preheat and interpass temperatures of 600-700 F will aid in the obtaining of a smooth weld and prevent undercutting. The deposited filler metal is erratic in behavior, and a somewhat longer arc is required in metal-arc welding to avoid freezing of the electrode.

The hardness of the deposited metal can be increased by suitable heat treatment, from approximately 150 Brinell in the as-welded condition to approximately 300 Brinell after heat treatment.

Copper-Zinc Alloys

The alloys within this group are commercially known as the brasses. The two predominant divisions within the group are the "low brasses" where the zinc content is 20% and under and the "high brasses" where the zinc content is between 20 and 15%. The melting point of these alloys is progressively reduced as the zinc content within the alloy is increased. In addition, both the thermal and electrical conductivity is reduced at elevated temperatures, with an increasing tendency toward zinc volatilization.

The brasses containing lead to promote machinability will fusion weld with difficulty since the lead has a tendency to "sweat out" and oxidizes readily,[4] resulting in a porous and weak weld. A reasonably good oxyacetylene weld can be made, however, by the use of an oxidizing flame and the application of plenty of flux.

Oxyacetylene welding of the low brasses, which include gilding metal, commercial bronze, red brass and low brass, can be accomplished in almost any position; the recommended electrode is the 1½% silicon rod.[5] The use of this rod is particularly recommended where corrosion resistance of the weldment is important. Due to the relatively high percentage of copper within these alloys, thermal conductivity is sufficiently high to necessitate a preheat.

The high brasses include such compositions as cartridge brass, yellow brass, Muntz metal, naval brass and manganese bronze. All of these exhibit a greater tendency toward zinc volatilization. In oxyacetylene welding, usually a neutral flame is employed; where zinc vaporization is objectionable and where maximum soundness is required, the oxidizing torch flame may be employed to minimize zinc vaporization. Welding rods of identical analysis are available, and the copious use of flux is recommended.

In carbon-arc welding of all brass compositions, the 3% silicon rod is preferred,[5] especially where multi-pass welding procedures are to be employed. Phosphor-bronze welding rods containing from 8 to 10% tin can also be used in the fusion welding of the low brasses; however, they are limited to single-pass welding procedure. Considerable fuming may occur, particularly in the fusion welding of the high brasses, and it is necessary to provide a suitable exhaust system. Maintaining the arc on the filler rod[3] will aid in the reduction of fuming, and the use of a preheat to allow the use of reduced currents is also helpful. Flat-position welding is usually recommended, and backing is usually necessary, especially for light-gage material. A stress relief[3] should follow the welding of alloys with more than 15% zinc in order to preclude failure through stress corrosion.

Both phosphor-bronze and aluminum-bronze rods are used quite widely in the metal-arc welding of all brass compositions; the aluminum-bronze rod being preferred where high tensile strength, high fatigue strength[5] and corrosion resistance are required. The low brasses should be preheated to approximately 400 F; the high brasses to as high as 700 F. The choice of preheat temperature, however, will be determined not only by the thermal conductivity of the material but also by such factors as the mass factor, size and type of electrode and the current-carrying capacity.

Low zinc or red brass can be welded satisfactorily[5] by the inert-arc process, utilizing either helium or argon as the shielding gas. A copper-silicon welding rod is preferred. The amount of zinc fuming may be reduced by automatic welding[5] as the greater speed and the small puddle tend to cool the weld more rapidly, avoiding the vaporization of the zinc. The submerged-arc method of welding is not usually recommended.

* * *

Next Month: *Mr. Spencer will discuss the bronze alloys: silicon bronze, aluminum bronze and tin bronze, also the nickel-silvers and the cupro-nickels. In addition, he will give resistance-welding procedures for all the copper-base alloys.*

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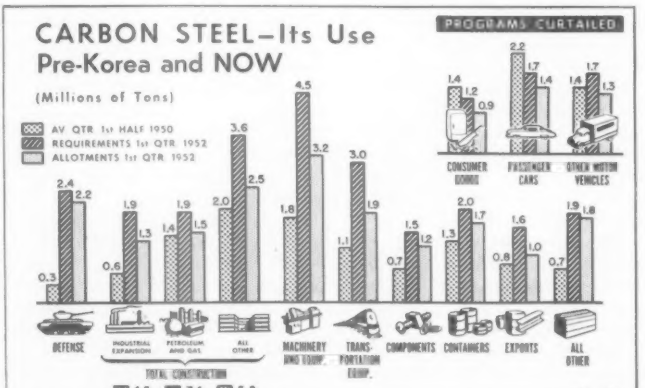
[1] *Arc Welding of Copper and Copper-Base Alloys*, F. E. Garriott, The Welding Journal, Oct. 1947.

[2] *Resistance Welding Manual*, 1948 ed. Resistance Welder Manufacturers Association; Philadelphia.

[3] *The Metals Handbook*, 1948 ed., The American Society for Metals, Cleveland.

[4] *The Welding Encyclopedia*, 13th ed., T. B. Jefferson, McGraw-Hill Publishing Co., Inc., New York.

[5] *The Welding Handbook*, 3rd ed., "Copper and Copper Alloys," The American Welding Society, New York.



A WELDOR'S WOES

BY FRANK TABOR

HOT BLOB IN SHOE

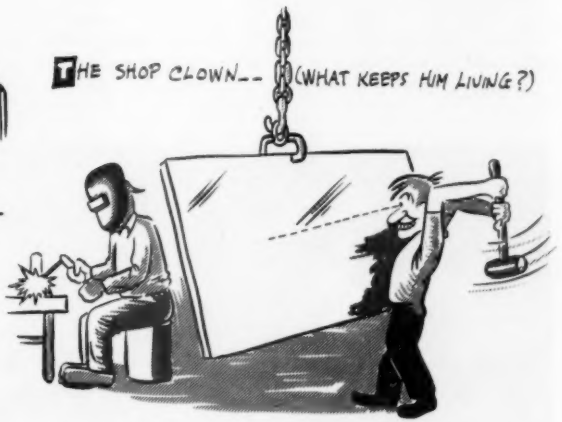
BURNED CUTTING TIP

THE EXPRESSIONS TELL THE STORY---

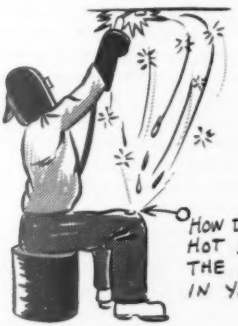
WET FEET AND GLOVES

--COULDN'T YOU MURDER THE BIRD THAT USES YOUR JOB FOR A BRAZING TABLE?

THE SHOP CLOWN-- (WHAT KEEPS HIM LIVING?)



SOMETHING WE'D ALL LIKE TO KNOW--



HOW DOES ALL THAT HOT SLAG FIND THE LITTLE HOLE IN YOUR TROUSERS?

FRANK TABOR

2—CLOSER tolerances are required for titanium than for stainless parts because of titanium's "springiness"

3—RYAN employee makes experimental assembly of a shrouded Piasecki exhaust turbine to check the fit-up

Titanium Takes a

By J. SEGARD

To determine the suitability of titanium to production of aircraft components, Ryan Aeronautical Co. has made studies that involve the forming of intricate parts.

TITANIUM—most modern metal of industry—is nature's paradox. More than any other element, this metal seems to exhibit exasperatingly contradictory behavior. Neither new nor rare, it costs the fabulous price of $15 per pound. With an extremely high melting point—higher than steel—it will not withstand continued use at high temperatures. Though so "affectionate" for other elements that it is never found free, titanium will not weld with any other metals by known processes. Yet it instantly combines with other substances when molten.

Truly, titanium is the "Dr. Jekyll and Mr. Hyde" of the metals.

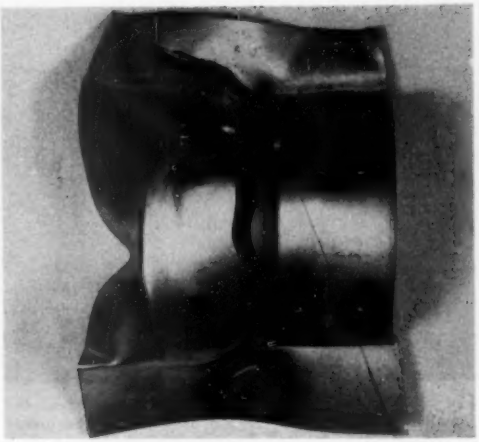
1—TITANIUM production is yet relatively small. Light rolling equipment of Allegheny Ludlum Steel Corp. produces these eagerly sought sheets

The Big Disappointment

Most keen disappointment titanium has caused metallurgists (who looked with relish upon its 3,150 F melting point and hexagonal crystalline structure) is its inadequacy to withstand long-time temperatures above 1,000 F. Under continued temperatures of more than 1,000 F, titanium suffers an irreversible absorption of oxygen and nitrogen, which rapidly reduces its ultimate and yield strengths and causes it to become brittle. If this deficiency could be overcome, a whole new field of applications would be uncovered.

In spite of its drawbacks, titanium is endowed with choice characteristics which seem to be especially planned for aircraft applications. Because titanium falls between the aluminum and steel alloys in both strength and resistance to temperature, it is the answer to many of the aircraft designer's problems. For

4—PART of shroud section for the Piasecki exhaust system shows spot welds and the deep-drawn contours



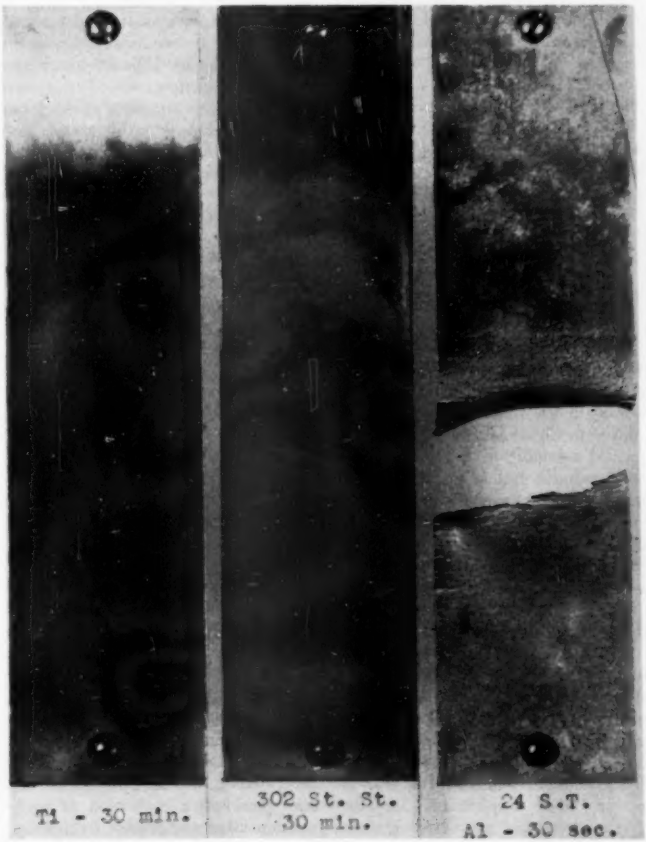
5—CRACK in titanium shroud was caused by failure to determine proper cold-forming limits of the metal

Test

years, engineers have been forced to specify heavier steel alloys in the design of structures that required more strength than aluminum alloys could provide at elevated temperatures. Because the aluminum alloys lose strength rapidly at temperatures above 300 F, a wide variety of components such as fire walls, ducts and shrouds had to be build of stainless steel.

Some titanium alloys can now provide 175,000 psi tensile strength, and new types with 200,000 psi are being developed. Titanium weighs only 56% as much as steel and approaches the best steels in strength. It retains its exceptional strength up to temperatures of approximately 800 F. With a lower linear coefficient of expansion and thermal conductivity than either aluminum or steel alloys, titanium is the only metal known to have an endurance strength consistently in excess of 50% of its tensile strength.

Titanium production is still relatively small. Allegheny Ludlum Steel Corporation's light rolling equipment is used (Fig. 1) to produce these valuable, eagerly sought sheets. Only 60 tons were refined in 1950. However, a new plant, to be operating by late 1952, will be able to produce up to 3,600 tons annually.



6—TITANIUM strip (left) showed no harmful effects after 30-minute exposure to 2,200 F flames. Aluminum (on right) disintegrated in 30 seconds

7—SPOT TACKING of titanium parts is identical to method used for spot tacking of stainless-steel parts

8—SHEAR testing a welded sample in development laboratories of the Ryan Aeronautical Co., San Diego

The development laboratories of the Ryan Aeronatical Co., San Diego, Calif., have recently completed studies of titanium's properties for cold forming and for hot forming. In the research at Ryan, flat sheet was formed to complex shapes to shroud the high-temperature exhaust system that Ryan builds for the Piasecki HUP-1 helicopter. Figure 2 shows Ryan spot-weld engineer Frederick Dever (left) and Dave Adams, metallurgist, checking the dimensions of a Piasecki shroud section fabricated from titanium.

Tolerances are Smaller

Closer tolerances are required for titanium than for stainless parts because excessive "springiness" makes mating more difficult. The Ryan employee in Fig. 3 is making an experimental assembly of a shrouded Piasecki exhaust system to check the fit of all the stainless-steel and titanium components. The Piasecki system channels the hot exhaust gases from the Continental R-975 engine that powers the HUP-1. The engine is "buried" in the helicopter for aerodynamic and dynamic reasons.

The complex, deep-drawn contours of a part of the exhaust system shroud can be seen in Fig. 4. This picture also reveals that considerable spot welding has to be done. Operating at a temperature of 400-500 F, this exhaust system would appear to be an ideal application for the weight-saving and heat-resisting qualities of titanium. However, it involves severe forming as well as resistance welding. Resistance welding of titanium to titanium appears to offer no particular problems, but the ability of titanium to withstand forming was an almost unknown quality at the time the Ryan laboratories began their investigation.

One of the basic aims of the Ryan investigation was to determine the adaptability of the machines and procedures for forming stainless steel components to the forming of titanium parts. Obviously, economic advantages could be gained if conversion from stainless steel to titanium fabrication could be made without extensive retooling.

Because so little was known, there wasn't much "book larning" to study. The Ryan laboratory established an experimental production procedure to determine the behavior of titanium when welded, formed and heat treated. To check the effectiveness of cold forming plus annealing versus hot working of titanium, a number of sheets 0.018 and 0.037 in. thick were used.

The Test Method

The principal test instrument was a spherical cavity machined into a steel plate. The diameter of the cavity was ¾ in. and the depth 7/32 in. Using an impact load, the titanium sheet was forced into the cavity with a steel ball. By measuring the total deformation, it was possible to obtain quantitative evaluation of various annealing and preheat treatments. The results are tabulated in Table I.

These tests indicate that either alternate cold forming and annealing, or hot forming is a feasible process. If cold forming and annealing are used, the point at which the part should be removed from the die is critical. Fig. 5 shows a cracked titanium shroud that was formed by a procedure involving cold forming and annealing. The crack was caused by difficulties in determining cold-forming limits of the metal in the die. Because of this difficulty, hot forming is more desirable.

In the hot-forming procedure, the part was placed in one end of the body half-stamping die, heated to medium red heat and deformed almost to completion. The part was then reheated and deformation completed. No springback occurred. A noticeable amount of lead adhered tightly to the surface that was struck by the lead punch. The part was successfully formed by drawing, heating and hand working in successive operations. The initial draw was fairly deep and entirely satisfactory.

An attempt was made to cold form two supports from the 0.037-in. material. The metal was placed in the die and hit several times. Forming was satisfactory except for a springback of about ⅛ in. measured at the ends. Annealing did not alleviate this condition. The thickness loss was found to be from 0.002 to 0.003 at the points of maximum deformation.

The scale on the hot formed parts was removed by placing them for five minutes in a salt bath descaling tank, which contained a mixture of sodium hydroxide and sodium nitrate at 850 F. After rinsing, the parts

were dipped for 30 seconds in a cold pickle solution of 46% nitric acid and 8% hydrofluoric acid to remove the titanium dioxide that formed in the salt bath.

Spot Welding Titanium

Spot welding of titanium parts does not differ greatly from the spot welding of stainless-steel parts (Fig. 7). Good results were obtained in spot welding titanium to itself with machine settings producing penetrations of from between 70 and 90%. Figure 8 shows the shear testing of a welded titanium sample. Shear values were approximately 650 lb for the 0.018-in. commercially pure titanium and 1,300 lb for 0.037-in. combinations. No success was experienced in spot welding titanium to other metals.

From these experimental investigations, Ryan development engineers are convinced that most stainless-steel forming techniques can be adapted to the fabrication of titanium parts similar to the Piasecki shroud (Fig. 2). The metal should be deformed at temperatures between 800 and 1,000 F, preferably closer to the maximum temperature. Lead dies are not suitable because of the lead pick-up, but steel or cast-iron dies should prove satisfactory. Heated dies would be desirable and economic for large-run production. Use of a controlled-atmosphere furnace would prevent the formation of most scale due to heating.

Although discovered back in 1791 by an English clergyman named Gregor, titanium was not produced commercially until 1946 when William Kroll, U. S. Bureau of Mines engineer, evolved a process for separating it from its ore. A clue to the tremendous affinity that titanium has for other substances can be gleaned from the fact that the ore can be purchased in the market at only two cents a pound but the refined metal costs from $10 to $20 per pound. Major sources of the metal, which is still produced on a very limited basis, are Titanium Metals Corporation of America and Rem-Cru Titanium, Inc. Another company, Horizons, Inc., is hard at work on a new process for refining titanium that promises to reduce its present production costs by 80%.

Greatest immediate use for titanium and its alloys will undoubtedly be in the formation of aircraft "skins" or surfaces for supersonic planes. Friction-induced heat is now zooming temperatures of these high-speed aircraft to well above limits of aluminum alloys' hot strengths. Titanium could handle these critical temperatures with ease and buoyancy.

The trouble, as before stated, is the inadequacy of titanium to withstand continued temperatures above 1,000 F. For short periods, titanium behaves beautifully. At exposures to flames of 2,200 F, titanium showed no adverse effects after a 30-minute exposure. Upon cooling to room temperature, it had regained its typical annealed strength.

Figure 6 supplies dramatic evidence of titanium's heat resistance for limited intervals (photo from Rem-Cru Titanium Inc.). The three test strips were, left to right: titanium, 302 stainless steel and 24ST aluminum alloy. All were exposed to flames at 2,200 F. The aluminum disintegrated in 30 seconds. The titanium strip showed less effect than stainless steel after 30 minutes of the fiery blast.

If the tendency to absorb oxygen and nitrogen under continual temperatures of more than 1,000 F could be overcome, so that titanium would remain serviceable up to temperatures of 1,600 F, a whole new field of usefulness would be uncovered. Combustion chambers, inner and outer cones, tail pipes and transition liners for jet engines would use large quantities of the metal.

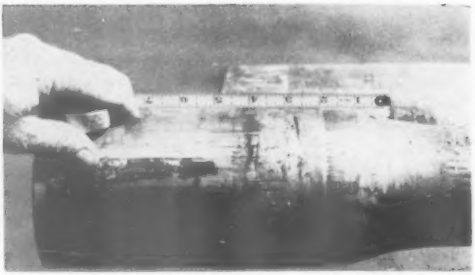
Ryan development engineers and metallurgists are working on this avenue of research, which falls into Ryan's extensive experience with high-temperature applications. Because titanium's deterioration at continued high temperatures appears to be due to events which occur at the surface of the metal, great hope for its future in hot spots is held if something can be done to protect the surfaces against oxidation and absorption. Ryan metallurgists are experimenting with ceramic coatings* on titanium to determine the success of the materials that have been so beneficial in preventing the oxidation of stainless steels at very high temperatures. The outcome of these evaluations may have an important influence upon the employment of titanium in these specialized fields.

*See "Ceramic Coatings Conserve Strategic Aircraft Alloys," page 87, The Welding Engineer, September, 1951.

Table I. Deforming Tests for Titanium Sheets

Deforming Temp.	*Treatment*	*Deforming Characteristics*
Room	None	Cracked when deformation was about 50% complete
Room	Deformed 50% of possible Annealed 1 hr at 1,170 F Deformation then completed	No cracking
Room	Deformed 50% of possible Annealed 40 min at 1,170 F	No cracking
Room	Deformed 50% of possible Annealed 20 min at 1,170 F Deformation then completed	Cracking appeared imminent
450 F	Previously heated to 1,300 F	Cracked when deformation was nearly complete
750 F	None	Cracked when deformation was about 75% complete
1,000 F	None	No cracking
1,300 F	None	No cracking

1—ALL RIGHT as far as it goes, this hard-facing job doesn't go far enough down the fast-wearing taper



2—TAPER is worn and requires reconditioning, but the large-diameter part of box is still serviceable

Tool Joints Hard-faced

This Process Is—

- Faster, simpler and easier. Tool joints are kept in service longer ; interruptions to drilling are minimized.
- Greatly increased wearing qualities help to keep repair costs down.
- Worn tool joints may be reconditioned economically because of the company's policy of regular gage-inspection.
- Preheating is done uniformly. Spalling and chipping are virtually eliminated.
- Hard-facing application is speeded up greatly by mechanized turning equipment. The driving unit and turning rolls are portable and can easily be transported to a drilling rig for on-the-job repairs.
- The oxyacetylene process has been found more satisfactory than are welding for this particular application. Less hard-facing material is used, and the deposit stands up better.

By FRED M. BURT

IN THE oil fields will be found some of the greatest examples of abrasive and impact wear to be encountered by industry. This publication has previously described how drill bits are hard-faced to stand up under their gruelling ordeal.* Tool joints represent another extensive (and important) use of hard-facing.

Tool joints are the threaded couplings that join two lengths of drill pipe together. Each joint has two parts: the pin (male) and the box (female). In so-called "unitized" drill pipe, both the box and the pin sections are flash welded to the drill pipe, one at each end, so that the three pieces become one.

Where Tool Joints Wear

When drilling is being done, the box is at the upper end of a length of drill pipe. The transition taper from the drill pipe to the larger diameter of the box is the first part of the enlarged tool joint to enter the hole. This 18-deg. taper and the box behind it will take the brunt of the wear against the walls of the well or against the sides of the casing. The taper, because it strikes the hole first, is subject to even greater wear than the large-diameter section of the box.

To overcome this abrasive wear, boxes are rebuilt with hard-faced deposits. Figure 1 is an example of a worn tool joint that has been hard-faced. The rings shown in this picture are small beads of mild steel deposited about 1 in. apart to serve as guides for the tungsten carbide hard-facing. The use of the mild-steel guide bands has since been discarded as being unnecessary. The rings were laid down by arc welding, and the tungsten carbide applied by the oxy-acetylene process. This hard-facing job was all right as far as it went, but the hard-facing did not extend more than ½ in. down on the taper. No provision was made to resist wear on the taper.

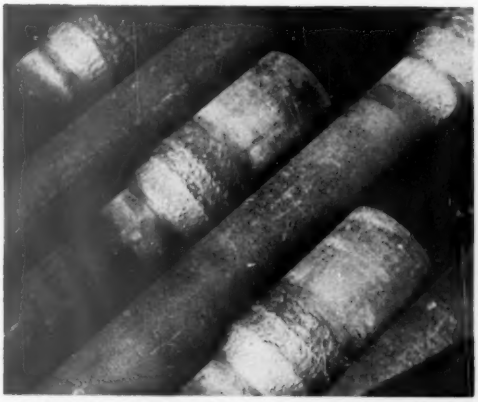
That Undercutting Problem

The undercutting of boxes due to abrasive wear presents a bothersome problem to drilling contractors. One oil company, however, has found a way to lick it by a special method of hard-facing. After surfacing hundreds of tool joints during the last two years, this company has evolved an excellent method of eliminating undercutting. The method is particularly valuable in cases where the taper requires reconditioning, but the outside diameter of the box has not yet been reduced to the point where a build-up is justified. Figure 2 illustrates such a case; the taper is worn and requires reconditioning, but the box is still serviceable.

Let us now look at some hard-faced tool joints (Fig. 3). These new joints on 4-in. pipe were hard-faced by the oxyacetylene process with tungsten carbide of 20-30 mesh. The carbide particles were contained within steel tubing 3/16 in. in diameter. The hard-facing was laid down in two passes, each 1½ in. wide, which ran down the shoulder nearly to the drill pipe. About ½ lb of tungsten carbide is consumed in an average joint. Larger amounts are required, of course, to bring badly worn joints back to size.

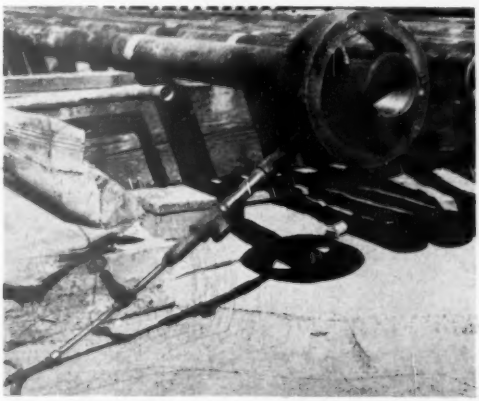
Worn tool joints have been satis-

*"Bits for New Oil Wells," p. 40, August, 1948, The Welding Engineer.



3—THESE new tool joints on 4-in. pipe were hard-faced with tungsten carbide by oxyacetylene torches

4—HOW GAGE is applied to the taper to check the amount of wear. Loop at opposite end is to check box



5—RING HEATER centers around the tool joint for preheating, indispensable to a good hard-facing job

6—MECHANIZED turning speeds task of hard-facing; an on-and-off foot switch leaves weldor's hands free

factorily rebuilt four or five times by this method, and there has been no chipping nor spalling. The oxyacetylene method has proved itself to be more satisfactory than the arc-welding method because of the lesser dissolution of the tungsten carbide. Less of the expensive material is used, and the deposits wear longer than arc-welded deposits.

Gage Checks the Wear

Periodic checking for wear is a most important part of the company's preventive maintenance program for tool joints. Specially designed gages are used regularly at the drilling rig. Figure 4 shows how one end of the gage is applied to the angle of the tapered section to check the amount of wear. The loop at the opposite end (left of picture) is applied to the box to test for wear. If the outside diameter is worn down so that the snap gage will slip over the box, then it's time for hard-facing repair. As a final examination the joint is inspected for eccentric wear in the pipe yard. Sometimes a complete rebuilding is necessary and sometimes a localized touch-up with hard-facing rod is all that's needed. The company's policy of frequent checking naturally eliminates the worst cases of wear.

Preheating helps to prevent chipping and spalling. Another advantage is that hard-facing materials deposited on preheated surfaces will be harder than those deposited on cold base metal.

Figure 5 shows the ring heater built to do preheating. The lugs on the ring center it around the tool joint so that uniform heating is assured. Liquefied petroleum gas serves as the fuel.

Pipe Turned for Hard-facing

After preheating, the pipe is turned mechanically for the application of hard-facing. The turning method is pictured in Fig. 6. The driving unit is connected by chain drive to the rolls that rotate the pipe. A variable-speed control for the turning speed, and an on-and-off foot switch that leaves the weldor's hands free are other features of this efficient set-up. A wedge-shaped steel jig (top or rear of picture) is used to roll the pipes on and off the rollers. The welding height, including overhang of the tool joints, is calculated to provide comfort for the operator.

1—CAR END swung into position for riveting. Note scattered studs

Photos courtesy Nelson Stud Welding

2—INSTALLING studs used to secure furring strips. Car ends have been assembled in a jig. Accuracy in location of the studs is assured by templates

Stud Welding Freight Cars

To meet the shortage of freight cars, production methods are being speeded up. Stud welding is saving time and money for America's leading car builders.

DOLLAR savings and smoother, faster production are two reasons for the use of the portable stud-welding gun in the building of freight cars. One advantage from the production viewpoint is that the gun can be readily shifted to whatever point in the assembly line will result in the best production sequence.

At Michigan City, Ind.

An excellent example of streamlined production is to be found at the Michigan City, Ind., plant of the Pullman-Standard Car Mfg. Co., where there are two identical lines, each capable of finishing an end of a freight car in 20 minutes. Each line is on a long roller conveyor, onto which the top and bottom halves of the ends and the side rails are fed directly from the presses.

Stud welding occurs at the last station, where two operations are performed: punched rivet holes are reamed, and 33 studs are installed. The studs are those supporting wooden furring strips across the corrugations of the car end. Accuracy in their location is assured by special templates developed to expedite production.

Figure 2 shows two weldors installing studs for furring strips on an assembled car end. Although the operation never requires the use of more than two guns at any one time, three guns have been provided so that no time will be lost in making adjustments for different sizes of studs.

The stud-welding guns are made conveniently accessible by means of a swinging jib, with hooks on which the guns are hung when they are not in use. The welding cable is fastened to this jib. As soon as all of the studs have been welded, the jib is swung out of the way to make room for the bridge crane that transfers the car end to the adjacent deep-gap riveting well.

Previously, the furring studs were inserted at this station. Now the crew in the deep-gap well is spared much time-consuming labor. Once the end has been swung into position (Fig. 1), the crew in the deep-gap well makes fast work of the straight row of seam rivets. Since the advent of the stud-welding station, the deep-gap operation has been synchronized with the other steps in car-end production, and much of the crane jockeying previously required has been eliminated.

At Mount Vernon, Ill.

A somewhat different production-line method for car ends is followed at the plant of the Pressed Steel Car Co., Mount Vernon, Ill. Between 24 and 36 studs, depending upon the design of the car, are used to secure furring strips, which are predrilled and put into place after the ends are hung. The stud locations are center-punched, and the ends are swung onto horses for stud welding, done at the rate of from four to five studs per minute.

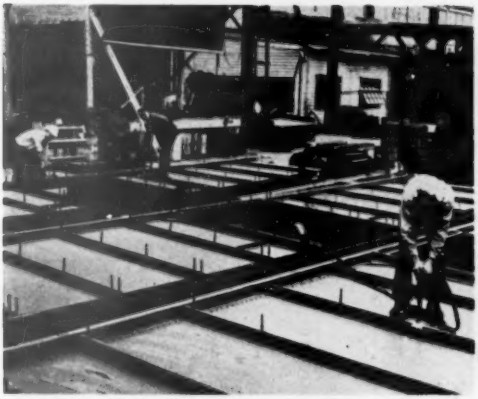
On the car sides, studs are also used to support furring strips on the side posts. Since the gun can be wielded in any position, it makes short work of end welding studs in what would otherwise be awkward spots.

At another shop, it is estimated that two men can repair seam welds and stud weld 60 car ends in an eight-hour period.

In the building of refrigerator cars, stud welding has also effected considerable savings. One "reefer" manu-

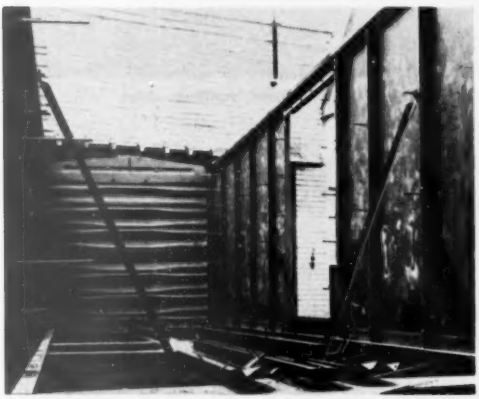
(Continued on page 34)

. . . at Pacific Car and Foundry

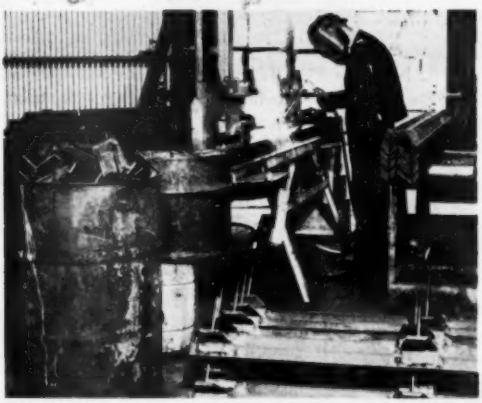


3—SIDE assemblies are laid in place by overhead crane. After stud welding, the sides are stockpiled until wanted

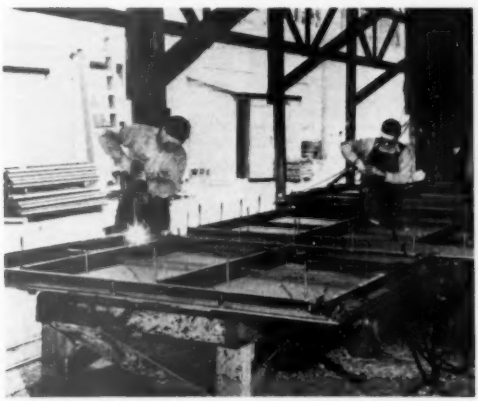
4—ENDS of cars are stud welded in flat position immediately after riveting of top and bottom halves



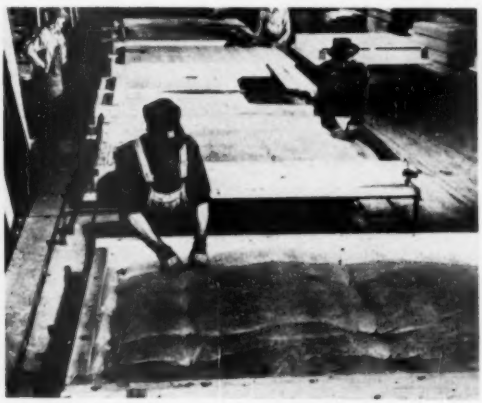
5—FURRING and insulation studs are in place when the car is assembled, speeding up interior finishing



6—BRACKETS to which a stud has been welded (see drum at left) are welded to cross bars for flooring



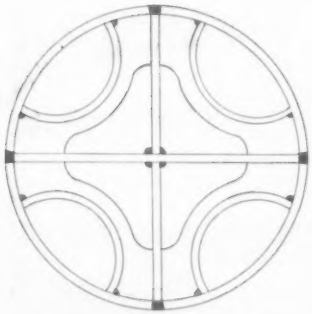
7—CAR DOORS also need studs. Weldors are affixing headless pins upon which insulation will be impaled



8—FINAL STEP in assembly of car door is to attach the clips that hold the insulation on the pins

1—ON EXCAVATING equipment, the bucket is fastened to dipper stick, in a column running along crane boom

Better Dipper Sticks by



3—END VIEW, showing locations of cross braces and U-stiffeners

Welding of tubes 20 in. in diameter and up to 45 ft long requires mobility of welding apparatus. One of the welding heads used is able to travel 100 feet.

A DIPPER STICK is about the most important part there is of a power shovel. The dipper is fastened on one end, which extends back between the members of the boom. By this arrangement the power shovel becomes a flexible, lifelike tool for scooping up and removing rock, dirt and other materials. In Fig. 1, we see a power shovel with its loaded 5 cu yd dipper at the end of the dipper stick.

Because of its location, the dipper stick is continually subjected to high bending, shock and impact stresses. To avoid dipper-stick failure, today's huge excavating machines require heavy-duty dipper sticks.

Sticks of this type are being built by the Manitowoc Shipbuilding Co., Manitowoc, Wis., for shovel applications. They are a 100% welded fabrication, most of it by the submerged-arc method. The welding of dipper sticks is important for two reasons: (1) the welded dipper stick is stronger and (2) production is simplified and speeded up.

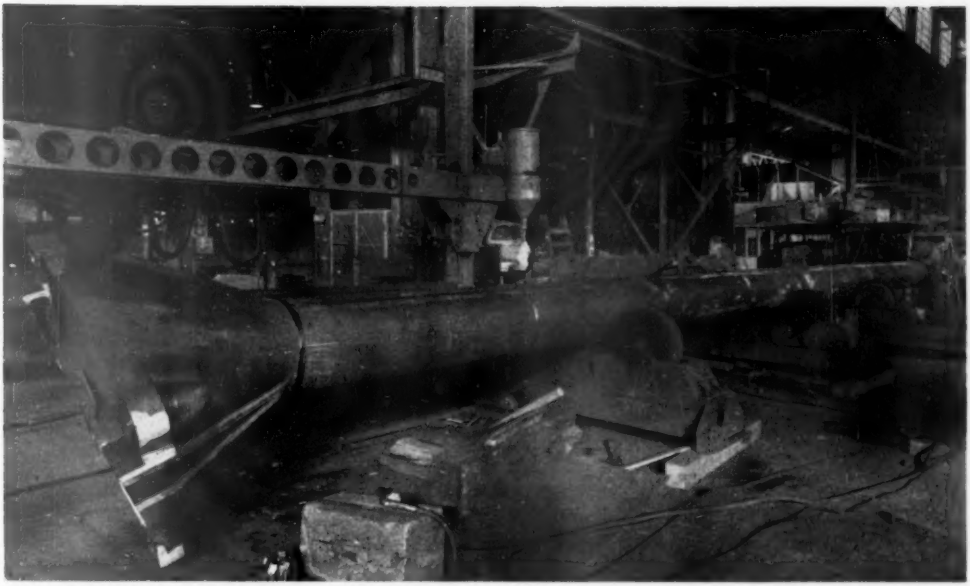
700 Feet of Welds

A typical heavy-duty dipper stick is pictured in Fig. 2. This completed unit is 20 in. in diameter and 45 ft long. In all, approximately 700 ft of welds were made to join the many pieces of steel that formed this big dipper stick. Though the length of dipper sticks will vary according to the size of dipper they are designed to handle, the diameter and manner in which they are fabricated remains much the same. To better understand the fabricating job, let's take a hurried trip through Manitowoc Shipbuilding's welding department.

Made in Sections

The dipper stick is a long tube made up by joining a number of 6-ft sections together. This gives flexibility in the length since similar subassemblies are used to obtain the desired length. Each of the shorter cylinders are made by joining 13 pieces of steel by 16 submerged-arc welds.

First welding operation is to join two 9 by ¾ in. plates to an 18 by ¾ in. plate to form a cross at right



2—ROLLERS turn the cylinders for girth welds. Welding head is mounted on carriage traveling a 24-ft boom

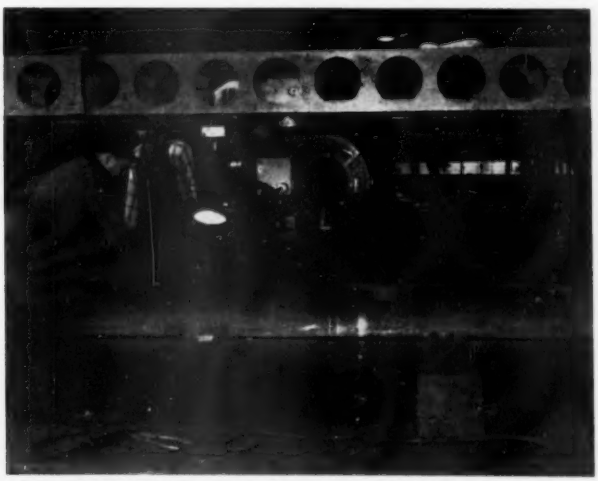
Submerged-Arc Welding

angles. This crosspiece provides internal bracing. To insure that these plates will maintain the 90-deg angle between them, gusset plates are welded near each end, as shown by Fig. 3.

Forming Half Cylinders

The outer shells of the cylinders that make up the dipper stick are each formed from two halves of ⅞-in. plate. The material is a low-alloy, high-strength steel. The plates for the half cylinders are prepared for welding by flame-cutting their edges to a 22½-deg bevel. A notch is also flame-

4—"JUNGLE JIM" makes the 45-ft-long welds that add the internal cross braces



5—WELDING HEAD on boom (also shown in Fig. 2) is used for some longitudinal welds as well as the girth welds joining the sections

cut in the center of each half cylinder, starting at a point about 2 in. from the end of the plate and running to about 2 in. from the opposite end.

The formed plates are reinforced on their interior by U-shaped stiffeners formed from $\frac{3}{8}$-in. plate. These stiffener members run lengthwise of the cylinder and are located so that their centers are midway between the beveled edge and the flame-cut slot. Each half cylinder is stiffened by two U-shaped sections, which are submerged-arc welded into place before the half-cylinder sections are joined together. Fig. 3 shows the location of the U-stiffeners, gusset plates and cross braces with respect to the walls of the cylinder.

After the half cylinders are tack welded to the internal bracing to produce the cross-section pictured in Fig. 3, the unit is positioned under a submerged-arc welding head for the making of longitudinal welds. The longitudinal welds do two things: (1) join the two half-cylinder sections through a submerged-arc deposit in the 45-deg vee and (2) tie the cylinder walls to the internal bracing, which serves as a back-up bar for this weld joint. A longitudinal weld is made through the flame-cut slot at 90 deg from each of the seams that join the half cylinders together. These four longitudinal welds join the internal bracing to the cylinder wall.

Job for "Jungle Jim"

To make longitudinal welds around 45 ft long naturally calls for a very large welding machine. The shipbuilding company has in service a mammoth welding gantry (Fig. 4), referred to familiarly as "Jungle Jim." This gantry has a cross traverse of 28 ft and a longitudinal travel of 100 feet. In addition, the 1,000-amp submerged-arc head can be lifted to weld parts 6 ft above the table. The driving mechanism, located in the box behind the upper rod reel, is hydraulically controlled through cams. The separate drives for bridge and carriage can be so proportioned that welding can be done on shapes by steering the head.

Jungle Jim's submerged-arc welding head is automatic in operation. Once the controls are set, the rod and granular welding flux are fed along the seam with a minimum of operator attention. A weldor-helper uses a vacuum hose to pick up the unfused flux after welding. The flux is sent to hoppers on the side-beam carriage, from which it drops down a tube into a bucket or directly into the flux hoppers. A simple pull-chain operates an opening that permits the flow of flux from the hoppers.

Jungle Jim is also equipped with an air compressor; it supplies air to operate clutches in the drive mechanism and for use with a weld scaling hammer called the "Jitter Bug." This air compressor is now used continually instead of regular shop air.

Another Head on a Boom

The longitudinal welds on the separate sections and the circumferential welds that join the sections together are made by another 1,000-amp submerged-arc welding head (Fig. 5). It is mounted underneath a traveling carriage riding on a 24-ft boom. The boom can swing 270 degrees—if it is swung 90 deg to the right from its center position, it can be placed over flat plate work with a melt trough behind the operators. Swung to the left, it places the head over turning rolls to make the girth welds on the dipper sticks (Fig. 2).

Welding is done at high speeds (10 to 15 ipm) and with a high amperage (700 amp, a-c) that enables deep penetration into the heavy plates. A $\frac{3}{16}$-in. welding wire is used. The final pass provides a surface that is almost smooth enough to eliminate chipping and grinding.

* * *

Acknowledgment is made to Linde Air Products Co. for the pictures and information upon which this article is based.

STUD WELD FREIGHT CARS

(Continued from page 31)

facturer estimates that stud welding saves sufficiently in man-hours and equipment to enable the shop to increase its productivity by one car a day.

At Renton, Wash.

Let us now visit the Renton, Wash., plant of Pacific Car and Foundry. The components of refrigerator cars are prefabricated, and all stud welding is done before the car is assembled. Car sides are brought directly from the unloading area by crane and laid flat for stud welding (Fig. 3). Afterwards, the car sides are stockpiled adjacent to the car assembly line.

Car ends are handled in the same manner. Immediately after the top and bottom halves of the end have been riveted together, the ends are stud welded in a flat position (Fig. 4). Like the car sides, the ends are then stockpiled adjacent to the assembly line. The fact that furring and insulation studs are already in place when the car is assembled (Fig. 5) simplifies interior finishing.

Figure 6 shows another type of production operation. The drum at the left of this picture holds brackets to each of which a $\frac{1}{2}$ by 8 in. stud has been welded. The bracket-stud subassemblies are then arc welded to cross bars to complete the flooring units. I-beam bunker supports are also stud welded in advance of their installation during car assembly.

Car doors are likewise preassembled. Long studs to support wooden liners and headless pins for insulation are stud welded at the same station. In Fig. 7, the operators have completed the placement of the long studs and are affixing the 10-gage headless pins upon which the insulation will be impaled. After all studs are in place, a rust-preventative asphalt paint is applied to the inside of the door.

Final step in door assembly is the placement of the insulation (Fig. 8). Unshielded "speed clips" hold the insulation in position on the headless pins. After this operation, the door is ready to go on the refrigerator car.

At Indiana Harbor

Another builder of refrigerator cars, the Fruit Growers Express, at Indiana Harbor, Ind., welds from 350 to 450 studs on each car. The studs range in diameter from $\frac{3}{8}$ to $\frac{5}{8}$ in. and are up to 10 in. long. They are used for such purposes as furring, floor assembly, insulation, ice-hatch covers and even routing boards.

In addition to the important savings effected during the actual production of freight cars, stud welding contributes two significant structural advantages: (1) Maintenance is reduced because no foothold is offered for corrosion as is the case with rivets, which can work loose and chip paint. (2) The elimination of holes makes it possible to realize the full strength of each steel member.

The result of it all is a sounder, better car.

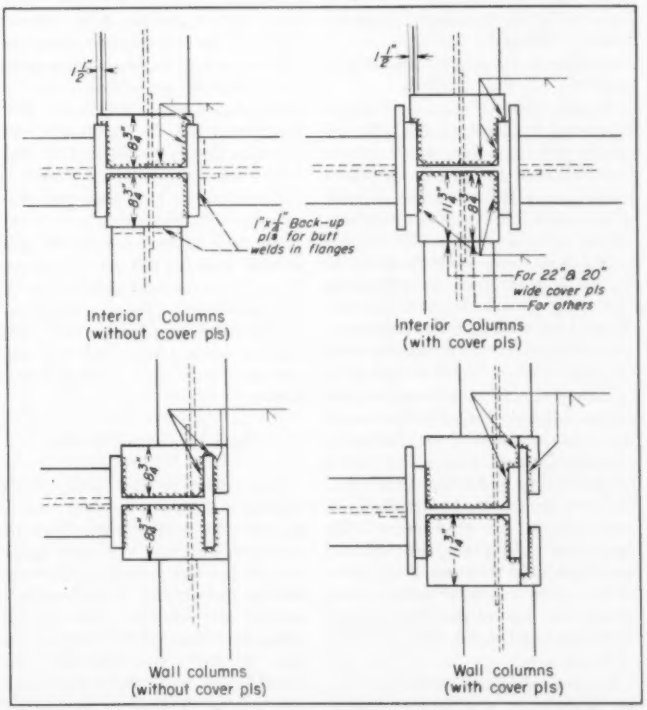
1—SHORTLY AFTER work began on the Prudential Insurance Company's 22-story building. Compare with front cover

Houston's New Welded Office Building

BY T. B. JEFFERSON

TEXAS has a reputation for doing things in a big way, and Houston is certainly living up to the Texas tradition when it comes to structural welding. In that city, during the past few years, practically every large office building, department store or hospital having a steel frame has been of welded construction.

Latest and largest of these frameworks is the Prudential Insurance building out near the Shamrock Hotel, a 22-story welded steel structure of 6,700 tons. Kenneth Franzheim is the architect for the building, and the welded frame was designed by Ward Butterwick, his structural engineer.



2—PLAN views for columns give an idea of the amount of welding needed

3—WELDER BANK consisted of four 400-amp d-c welders mounted on a movable steel skid. A transformer was located next to the welders, as shown

4—THIS weldor is working on a scaffold high above ground level

Figure 1 shows the Prudential Insurance building shortly after welding began, and this month's front cover pictures the finished structure. Thousands of welded joints were made between the taking of these two photographs. Altogether, 69,980 lb of electrodes were consumed in the construction of this building.

Mosher Steel Co., of Houston, fabricated the steel on this job and sublet the erection to Peterson Brothers, steel erectors. It was necessary to work with a variety of sizes of structural shapes with a consequent variety of weld joints. The beams varied from 14-in. wide-flange at 43 lb per foot to 33-in. wide-flange at 132 lb per foot. The 24-in. wide-flange beams were in the majority; nine different sizes were represented, ranging from 76 to 160 lb per foot.

Some welds were made to join two beams together and others to weld the beams and their cover plates to a column. All were groove welds of a single-vee type with a 45-degree bevel. On beam flanges, the weld size varied according to the thickness of the flange. For cover plates, the weld size was equal to the thickness of the plate. Moment plates shop welded to beam flanges were also prepared with single 45-degree bevel at the ends for field welds.

An unusual feature of the job was the manner in which cover plates were welded to columns at points where beam connections occur. A large number of columns were reinforced with cover plates varying in thickness from 2½ down to ¾ in. Heavy fillet welding was sufficient for connecting cover plates to columns except at the beam connection points. At these points, the heavy cover plates were slotted for connection to column, made by means of slot welds. With columns having cover plates that were 1½ in. or less in thickness, plug welds were used in the similar locations.

Erection clips were shop welded to columns with fillet welds.

An idea of the amount of shop welding done on this job may be obtained from the four sketches of the columns (Fig. 2). These include plans of the interior columns, with and without cover plates, and also wall columns, with and without cover plates.

Shop vs. Field Welding

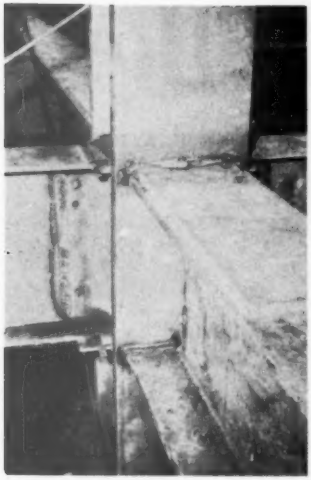
Very close to two-thirds of the welding was done in the shop prior to erection. Shop fabrication by welding eliminates many expensive operations of handling, punching, reaming, drilling and riveting. Sometimes these savings are partially offset by the costs of accurate plate-edge preparation. Mosher Steel, however, has learned from considerable experience with welded construction how to use simple devices to guide flame-cutting machines so that it costs very little more to trim the edges accurately. The beveling was done along with the trimming in one pass of the flame-cutting machine. In this manner, much of the normal extra cost for beveling was eliminated in preparation of the beam flanges and connecting plates.

The big advantage of shop welding is that the work can be positioned. So important is this advantage that the weldor can produce about 75% more weld footage when working in the shop than in the field for a bead of comparable size.

Welding Machine Bank

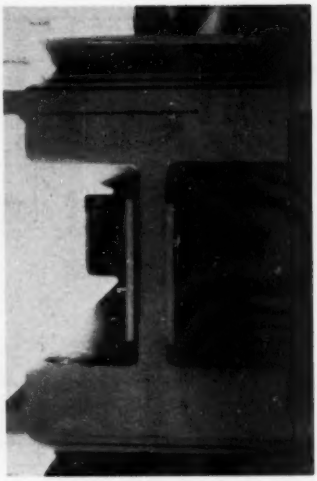
The field welding was featured by the manner in which the welding machines were handled. Both a-c and d-c welders were used. In Fig. 3, we can see a typical set-up for the welding bank. Power was brought in over a high line to a transformer serving a group of welders.

The welding machine bank consisted of four 400-amp d-c welders mounted on a welded steel skid. The skid was moved to a convenient spot for a welding operation, and the transformer was located by the welders. As work progressed, the welding bank and its transformer were moved onto the steel structure and raised from floor to floor so as to keep the length of welding leads to the mini-



5—JOINT connecting two 24-in. beams to column. Note cover plate

6—TRICKY connection was made to join floor beam to web of column



7—COVER plates increase thickness of 3 1/16-in. flanges to 5 in.

mum. The weldors were able to do an efficient job with a minimum loss of current through the welding leads.

Working under Difficulties

About one-third of the welding on this job was done in the field. Having built a large number of the welded steel frames erected in the Houston area, the erectors knew how to handle the work efficiently. Some of it, however, was accomplished under such difficult working conditions as are shown in Fig. 4. The weldor appears to be shielding himself from the arc with his left hand, but appearances are deceptive. He is in reality hanging on to a wind-bracing cable while he makes a connecting weld from a rope-supported scaffold.

An advantage of field welding over field riveting is that a lesser number of men are required for a welding crew, making it possible to do field welding less expensively than field riveting. Construction can also be speeded as the weldor can follow behind the riggers and erectors much more closely than the riveter can on a riveting job. The only delay that enters into a welded steel frame is the plumbing of the erected framework. Experience of the engineers, fabricators and erectors has led to development of erection and welding procedures, sequences, etc. which hold shrinkage and locked-up stresses to a minimum, but there is some slight shrinkage at each joint and therefore some allowances must be made in plumbing the columns before welding takes place and occasional checking as the welding proceeds. By following the established procedures, however, the weldor has clear sailing..

Figure 5 pictures a typical column joint connecting 24-in. wide-flange beams to a column. The beam running into the flange of a column is fitted with a cover plate while the beam that goes into the web of the column does not have such a plate. The manner in which a floor beam is connected to the web of a column is rather intricate since it requires five plates to make the connection. Such a connection is pictured in Figure 6.

In this type of beam connection, horizontal double plates are connected to the web as well as to the two flanges of the column. A pair of these double-plate arrangements are located on the column to allow them to be in alignment with and connected to the upper and lower flanges of the beam. The fifth plate is welded vertically to the web of the column and is slightly off center so that it can be field welded to one side of the web of the beam.

The beam flange connecting plates vary in thickness. The outside or top and bottom plates have a minimum thickness of ½ in. The inside plates will vary in thickness from ¾ to 1⅛ in., depending upon the thickness of the abutting beam flange. Similarly, the vertical web connection plate varies in thickness from ⅝ to 1 in., depending again upon the thickness of the beam web to be lapped.

Building up Column Flanges

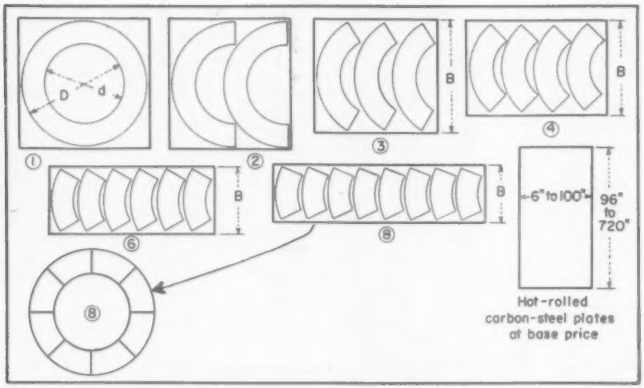
It hardly seems possible that a 14-in. WF 426-lb column would need reinforcing. Nevertheless, Fig. 7 pictures the manner in which cover plates have been added to such a column to increase its load-carrying capacity. The column flange is 3 1/16 in. thick, and the cover plates that were added to each flange build up the total thickness to over 5 in. This massively reinforced column is typical of those used for the first two floors.

Though much of the fabricating on these columns was done in the shop, considerable field welding was involved in the erection of the 40-ft columns. The field welding schedule included: 16 lineal ft of 1⅛-in. groove welds; 49 ft. of 1-in. groove welds; 149 ft of ½-in. fillets; 13 ft of 7/16-in. fillets; 60 ft of 5/16-in. fillets and 3 ft of ⅜-in. double-fillet welds. When you consider that there were 74 columns similar to the one of Fig. 7, you can easily see why so much welding was done on this particular job.

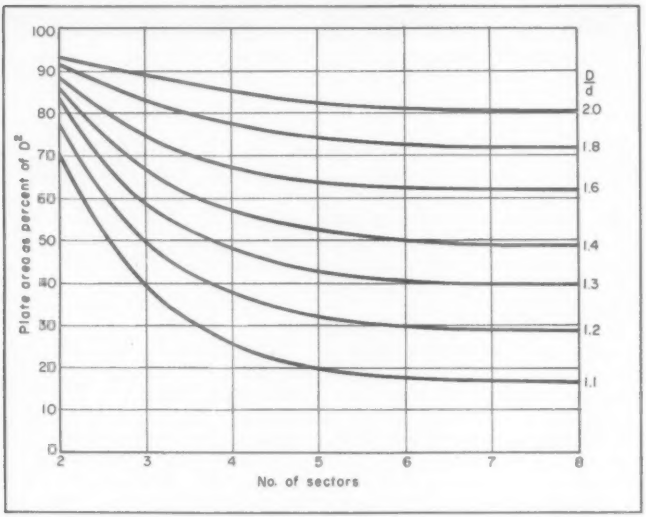
The general contractor for the building project is W. S. Bellows Construction Company.

How to

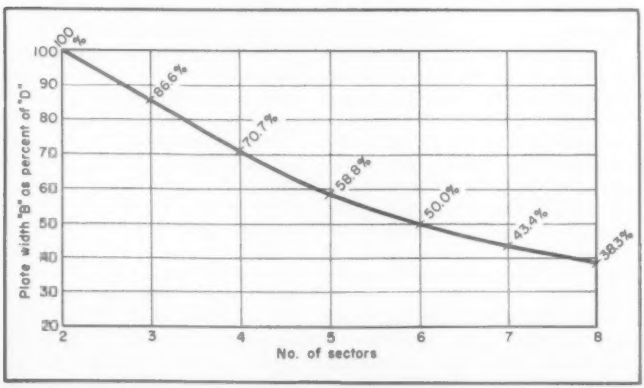
BY H. W. HAMM



1—FLAT RINGS can be cut out in sectors to reduce the plate width, "B"



2—AREA CURVES for various ratios of outside and inside ring diameters



3—HOW width of nesting plate is reduced by increasing number of sectors

WHILE you are reading this, take a compass and draw a circle representing the outside diameter of your ring. Divide the circle as you would cut a pie into equal wedges or sectors (a sector is defined geometrically as the area enclosed between two radii and the included arc of the circle). Now draw an inner circle having the same center to represent the inside diameter of your ring. Erase all of the sector divisions that lie within the inner circle. The remaining lines, between the two circles, will divide the ring into "truncated" or sliced-off sectors. From this point on, the term "sector" will refer to these sliced-off bits.

What You Must Consider

After the sectors have been cut, they must be welded together to form the complete ring. In order to obtain maximum economy in the production of the flame-cut and welded rings, the following points are important:

(1) Plate size will be minimized by dividing the ring into a number of sectors, which are welded after cutting.

(2) The number of pieces to be cut from one plate should be such that you can order a plate size falling within the base price range. If this is not possible, the plate width should be held to a minimum. The reason for this is that the cost increases rapidly with widths above 100 in., the upper limit for base price application.

(3) The plate width can be reduced by increasing the number of sectors into which the ring is divided. The more sectors there are, the smaller the width will be.

(4) The cost of the radial welds that join the sectors into the circular ring must be balanced against the saving in plate costs. The more sectors, the more welding to do. Obviously, there will come a point at which it costs more to weld the sectors together than can be saved in material.

Cut Rings to Save Plate

Avoid tedious arithmetic by using these convent charts to work out the economical nesting pattern.

We are now ready to examine the charts. Chart 1 gives plate layouts for a one-piece ring and for rings divided into two, three, four, six and eight sectors. How the eight sectors will fit together after you have cut them out is shown by the sketch in the lower-left-hand corner. The rectangle in the lower right-hand corner gives the ranges of widths and lengths for which the base price applies.

The outside diameter of the ring is represented by a capital "D." The inside diameter is represented by a small "d." It will be necessary to know the ratio between these two diameters, expressed as D/d. Figure this out to the nearest tenth, which will be sufficiently accurate for the estimates of the chart.

Chart 2 is used to determine the total plate area required when a ring is to be divided into two, three, four, five, six, seven or eight sectors. This area is expressed as a percentage of the square that is needed to cut out the ring in one piece. The area of the square is D^2 since D is the outside diameter of the ring.

To use Chart 2, you will have to calculate D/d in advance. Say this works out as 1.4, and you want to weld the ring from six sectors. Read up along the 6 line until you reach the 1.4 curve (right-hand scale), then go horizontally from the point of intersection to read the value on the left-hand scale. In this instance, the point of intersection falls exactly on the 50 line, so the area of the plate from which the six sectors of the ring can be cut is 50% of the area of the square that would be needed to cut out the complete ring.

For a numerical example, a ring with outside diameter of 168 in. and inside diameter of 120 in. is to be flame-cut. D/d = 1.4; D^2 = 28,224 sq in., which is the area needed if the ring is to be cut out in one piece. Since the ring is to be cut out in six pieces, the required area, as we have just found, is only half of 28,224 or 14,112 sq in.—surely a substantial saving in plate costs!

You cannot work backwards so easily; that is, to find the number of sectors from the D/d ratio and a given plate area percentage. To do it in this manner involves some troublesome arithmetic to determine the plate area as a percentage of D^2. However, the chart lends itself very well to rapid trial-and-error estimates. Given the D/d ratio, it's very easy to test the sector lines one at a time to see how the plate area percentage changes as the number of sectors varies.

An interesting thing that you can learn from a study of the curves in Chart 2 is that you won't save a great deal of area by increasing the number of sectors over six because the ratio curves tend to become straight horizontal lines from six on. So far as the saving in plate area is concerned, you can forget about dividing your ring into more sectors than six. It is a different matter, of course, if you wish to keep the plate width down so that it will either fall within the base price range or reduce the extra charge for widths above 100 in.

Curve for Plate Widths

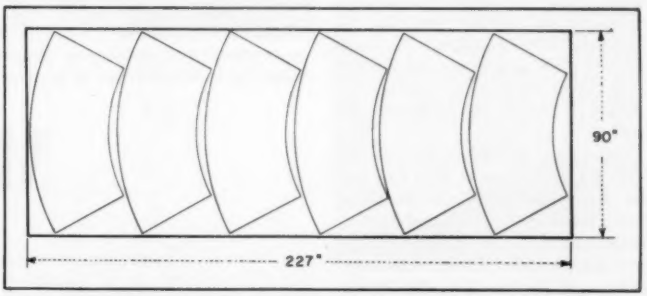
This brings us to Chart 3, the width curve. The plate width is expressed as a percentage of D, for two, three, four, five, six, seven and eight sectors. To aid you in calculation, the exact percentage to three decimal places is given at each point of intersection with the curve. Thus if you have a seven-sector ring the width required for nesting will be 43.4% of D, the outside diameter of the ring.

If you have a six-sector ring, the plate width will be 50% of D. To continue with our former example, the ring with D = 168 in.; d = 120 in., the width of the plate needed for six nesting sectors will be 50% of D or 84 in. This width is within the range for base price.

Naturally, when we have both the width and the area, the plate length is easy to find. In our numerical example, we found that the area needed for a six-sector ring was 14,112 sq in. Divide this by the 84-in. width, and you will get a length of 167.9 in.—168 in. for ordering.

Now for another exercise in using the curves. We want to cut six sectors to produce a ring of 180-in. OD. and 112.5 in. ID. D/d = 1.6. From Chart 2, we find out that the required area is 63% of D^2 or 20,412 sq in. From Chart 3, we find that the six-sector layout requires a plate width that is 50% of D or 90 in. 20,412 ÷ 90 = 226.8 in., 227 is good enough. So we will need a plate 90 by 227 in. to produce the six-sector nesting pattern, Chart 4.

Actually, our plate will have to be a little bigger since extra stock will be needed to allow for flame-cutting. This can be taken care of by adding a small amount, up to 1 in., say, to the plate width and length so that the nesting sectors will not be touching in the plate layout.



4—SIX-SECTOR layout for flat ring with 180-in. outside diameter, D, and 112.5-in. inside diameter, d, requires a plate area of 20,412 sq in.

Metallizing

Two layers of vinyl aluminum overcoating on a metallized aluminum layer will provide 25 years of protection for the steel on a Kansas City viaduct.

By W. C. HENZLIK

As a steam locomotive chuffs slowly under a viaduct or overpass, its smoke billows out around the sides and up through any openings in the highway level. It's an interesting and even beautiful sight on a cold winter day, but bridge maintenance men hardly ever think so.

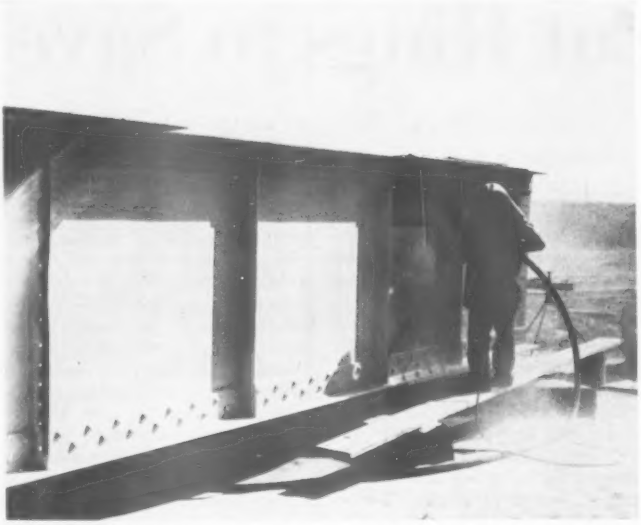
They know that sulphur in the smoke is combining with moisture in the air to form sulphurous acid droplets on the viaduct's steel surfaces. Enough acid is formed to ruin the paint in a few months and corrode the steel if quick cleaning and repainting can't be managed. Until recently, exposed steel in such corrosive atmospheres (as well as in steel mill areas, near chemical plants, sea coast right-of-ways, etc.) caused much cussing, cleaning and repainting with no break in the cycle in sight.

Now, sprayed aluminum is given an overcoating of a special aluminum vinyl plastic to provide 20 to 50 years of anticorrosion resistance for newly built steel bridges and viaducts. Though bridge members already erected can be cleaned and coated by the new process, the expense involved is considerably more than for thus treating new structures.

Kansas City Example

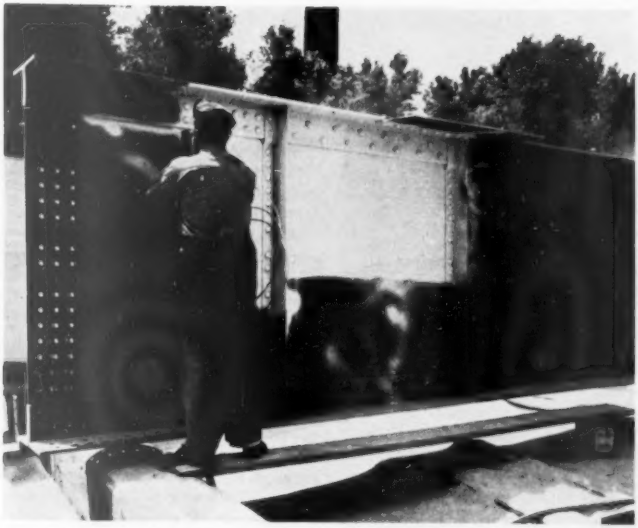
A fine example of this new maintenance aid is the Broadway Woodswether viaduct built last year by the municipal government of Kansas City, Mo. When the bridge was designed, the architects, Howard, Needles and Burgdorf, specified a metallized aluminum-vinyl covering for eleven riveted steel spans, several 80 ft long by 7 ft deep. These were to be positioned directly above six sets of railroad tracks. Even though railroads are rapidly switching to Diesel-electric propulsion, enough steamers will pass under the viaduct in the next 20 years to justify this special protection, the architects figured

Fabricator for the spans was the Kansas City Structural Steel Co., under subcontract to Bennett Brothers Construction Co., general contractor. Metallizing and vinyl spraying operations were handled by the metallizing division of Nooter Corp., St. Louis. Walter B. Meyer, metallizing engineer, was in general charge.



1—SANDBLASTING scale, rust and dirt off panel for a viaduct span. Going over railroad tracks, the span will be bathed continually in smoke

3—TWO-MAN application of aluminum was both possible and desirable since the metallizing had to be done within four hours after sandblasting



2—SPRAYING of pure aluminum onto the sandblasted surface is done by Joe Peressin. It took at least two passes to achieve the 0.008-in. thick layer

4—FINISHED section of a span awaits erection into viaduct structure. After erection, joints and connections were also blasted and metallized

a Viaduct

For metallizing, the fabricated spans were set up on wooden cross ties near the viaduct site with the aid of a railroad yard crane. Work went forward according to a tested system, developed by the Metallizing Engineering Co., Long Island City, N. Y. It comprises cleaning of the steel workpiece with sandblasting, metal spraying with pure aluminum and finish coating with two layers of aluminum vinyl overcoating.

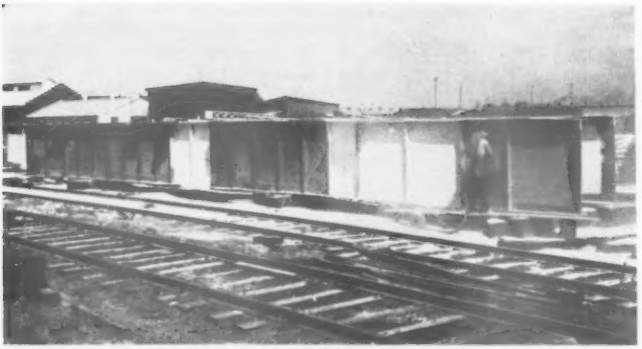
Figure 1 shows sandblasting grit taking off dirt, scale and other contaminations from one panel of a span. The operator is a member of Local No. 10, International Association of Bridge, Structural and Ornamental Iron Workers (AFL).

Checkerboard blasting and metal spraying of panels in the spans (Fig. 6), was due to no haphazard circumstance but rather carefully planned scheduling. Since metallizing and the application of plastic resins just can't be carried out next to a high-pressure sandblasting nozzle, it was necessary for the several crews to work in different areas of the yard. To complicate matters further, it was necessary to start metallizing within four hours after blast cleaning to insure that no contamination would have a chance to collect on the steel.

Keeping the seven-man gang cleaning, spraying and overcoating at the same time took some doing. Credit went to Joseph Peressin, Nooter metallizing superintendent, and Tom Engel, iron worker foreman, for this trying task.

Some 220 tons of angular No. 4 Joplin chat were thrown at the steel spans through the sandblast nozzle. Before the main cleaning job began, a standard of cleanliness and roughness was set up. This consisted simply of blasting a sample steel plate until

5—FOREMAN Tom Engel measures thickness of the aluminum coating with a special magnetic indicator



6—CHECKERBOARD pattern on an 80-ft span is due to carefully planned schedules to keep the hazard of sandblasting away from metallizing crews

it could be cleaned no longer or roughened any more. Visual comparisons between this plate and the separate panels were continuously made to insure a high degree of premetallizing cleanliness.

Pure Aluminum Sprayed

Standard hand-operated metallizing guns were utilized to spray the 2S aluminum on the steel (Fig. 2). The aluminum, in the form of ⅛ or 3/16 in. wire, was fed to the gun and melted by an air-acetylene flame. The molten droplets of metal were then projected through the metallizing nozzle by air pressure.

The technique of metal spraying was taught from scratch to the iron workers, right on the job. According to Mr. Meyer, they sprayed some 3,000 lb of aluminum with a high degree of skill. Metallizing had to be done within the four-hour limit previously mentioned. To speed the work, it was usually possible to position the spans so that two men could spray at once (Fig. 3).

Minimum thickness prescribed for the coating was 0.006 in., with an average thickness of 0.008 in. being regarded as desirable. The specified thickness of metal was always applied in multiple layers; no less than two passes were laid over every part of the surface. Sprayed metal was overlapped on each pass to assure uniform coverage.

Two types of inspections were performed on the aluminum coatings. The first, for thickness, involved the use of an "Elcometer," a small instrument about the size and appearance of a photographic light meter. It measures directly in thousandths of an inch the thickness of a non-magnetic coating (aluminum, zinc, tin, etc.) on a magnetic material such as steel. In Fig. 5 Foreman Tom Engel uses the meter on a sprayed panel.

The coating was also checked by eye to see that it adhered firmly and was free from uncoated spots, etc.

Finally, a special aluminum vinyl plastic overcoating was laid over the 0.008-in. metallized coating. The coated surface was carefully checked for any oil, grease or other contaminants before cladding with the vinyl. No other thinner or cleaner than those specially designated for vinyl resins can be used because various types of deteriorations may set in.

A modified spray gun with an external-mix nozzle applied the vinyl plastic material. The first coat of plastic included one-fourth thinner by volume. After the first coat had dried for 30 minutes, a pure plastic solution was applied.

Altogether, more than twelve weeks of work went into protecting the eleven spans. Bad weather plagued operations most of the time, with the disastrous Kansas City flood climaxing everything. The tremendous volume of floodwater covered the entire scene. However, Mr. Meyer and Mr. Peressin managed to be back at work three days after the levee broke to get things into shape again.

Figure 4 shows how a span looked after the final plastic coat had been applied. Some 25,000 sq feet of surface on eleven spans were corrosion-protected for the next 25 years.

To complete the job, all joints, connection plates and fittings on the coated spans were blasted, metal sprayed and vinyl covered. This was done from scaffolds after the connection members had been erected into the viaduct skeleton.

Plastic More Economical

Past practice has been to use aluminum coatings of 0.015-in. thickness, especially on such jobs as barges, piers, tanks and buildings. It has proved more economical, however, to hold the aluminum thickness to 0.008 in., as at Kansas City, and then coating it with two layers of vinyl plastic. Not only is a lower cost realized, but the service life is extended. Cost of a job like this usually runs between $0.90 and $1.20 per sq ft, depending on availability of air, rigging, labor, etc. When the coating begins to wear, a new vinyl layer can be easily applied over the old surface to increase the corrosion protection for another 25, 50 or even 75 years.

For other applications where corrosion is costly, many metallizing systems have been developed.

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You'll find your local Alcoa Distributor listed under "aluminum" in your classified phone book. Alcoa sales offices are also located in all principal cities. Or write:

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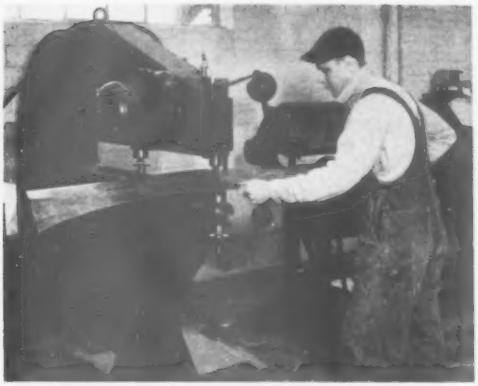
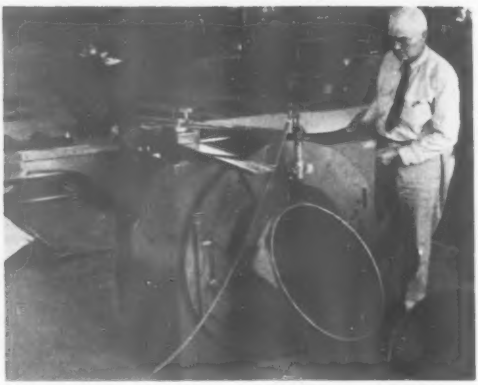


SHAPE CUTTING, circle cutting, forming and flanging can be done with shear's double tool action



JOINTS and openings of many types are cut in piping automatically by Woerner flame-cutting machine

All-Purpose Metal Shear

A NEW metal shear cuts steel, aluminum and brass with two tools, an upper spring-loaded one that reciprocates vertically and a lower one that remains fixed. The "Tru-Edge" contour shear does not punch, says the manufacturer, but shears by a new principle of operation that eliminates resistance to feeding and turning the workpiece. Cutting speeds vary between 10 and 36 feet per minute.

Other materials that may be cut into irregular shapes, circles or straight lines are stainless, copper, fibre, expanded metals, screen, magnesium and paper products. A piercing feature permits cutting inside of the sheet without a starting hole. Edge trimming of plain or irregular shapes, flats or formed pieces may also be performed. Segments, head sections, rings and all shapes requiring specific arcs can be cut to close tolerances with special attachments for holding and centering workpieces. Nibbling and slot-cutting can be done.

In addition, flanging, forming, beading and stiffening operations can be performed on the machine on metals up to 12 gage thickness. A broad range of special tools with standard ¾ in. bits will fit the shear.

BAKER BROTHERS, INC., P. O. Box 101, Station F, Toledo, O.

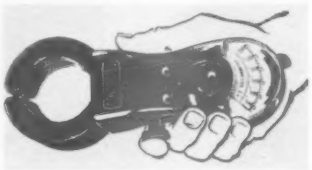
* * *

Nickel-Free Electrode

WELDING maintenance and repair of cast iron can still be carried out with a new nickel-free electrode, "EutecTrode 27." This rod does not replace the critical nickel-bearing electrodes for all uses. It is said to offer an extremely high-tensile weld with a uniform amount of carbon in the deposit.

EUTECTIC WELDING ALLOYS CORP., Dept. P, 172nd St. & Northern Blvd., Flushing, N. Y.

* * *



Tong-Type Ammeter

A NEW high-current "Amprobe" voltammeter that measures up to 1,200 amp can be carried in a coat pocket. Useful for check welding cables, electrical connections and other circuits, the Model 1200 has six important features: a new doughnut-type transformer to cut down positioning error; six ammeter ranges and three voltmeter ranges; voltage test leads with a safety-type plug; completely insulted probe jaws; wide-angle high-visibility window for readings in poor light and d'Arsonval jeweled movement with Alnico magnet.

PYRAMID INSTRUMENT CORP., Lynbrook, N.Y.

Piping Profile Cutter

FOR the oil refinery, chemical plant, pipe fabricator or maintenance shop the new Woerner tubular profile cutter offers precision cutting of pipe up to 26-in. OD. Capacity of the standard machine ranges from 1 to 6 in. OD pipe. Mitres, angle saddles, offset saddles, 90-deg. saddles, square-offs and bevels can be cut with various pattern guides.

Besides profile cutting of piping, the machine can be used as a welding positioner for production pieces or for hard-facing round shapes. The operator may select his method of operation, manual or electric motor drive. A speed control is available through a hydraulic variable-speed transmission. All controls are on one simple panel.

All standard machine-cutting torches will fit the torch holder which is attached to an adjustable rack and gear mounting. The pipe is held in a hollow steel spindle that has semi-self-centering chucks, for rapid handling.

All moving parts are enclosed in the welded steel frame. Ball-bearing mountings are used on moving parts which are serviced through handy access panels. A space is provided in the cabinet for storing patterns.

Power source required is 110-volt a-c or d-c. Floor space dimensions are 18 by 24 in. for the standard machine (not shown above). Shipping weight is 355 lb crated.

I. A. WOERNER, Lebo, Kansas.

Anti-Fog Solution

NEW anti-fogging and lens cleaning solution called "No-Mist" can be used on glass and plastic surfaces. The invisible coating is said to be non-streaking.

CAROL CHEMICAL PRODUCTS CORP., 368 East 45th St., Brooklyn 3, N. Y.

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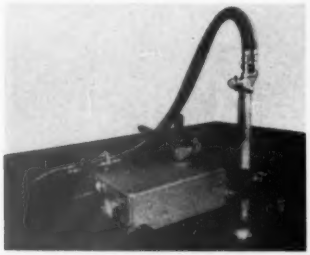


Gas Cutting Machine

VERSATILE design of the traveling carriage on the new No. 20 "Radiagraph" portable cutting machine permits it to be also used with "Aircomatic" inert-arc metal-arc equipment and "Heliweld" inert-arc machine torches. As the "Radiagraph," it is a portable, motor driven, straight track-guided flame-cutting tool.

The self-contained transmission and other operating parts on the carriage are said to require little maintenance. Conveniently located controls vary the speed over a 2 to 60 ipm range.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

* * *

1,000-Lb Positioner

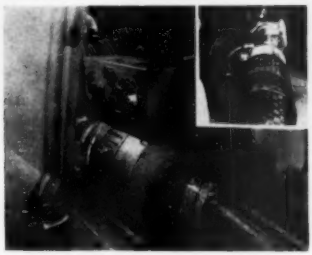
TWO sizes of medium-duty welding positioners will manipulate respectively 1,000 and 2,500 lb. A compact, three-in-one table tilting frame eliminates the indirect transmission trains used on other types of positioners. It is also said to reduce to a minimum backlash and lost motion in the table rotation system.

Rotation can be varied through a 10-to-1 speed range with a handy wheel adjustment. Both the 1,000-lb Model P-10R and the 2,500-lb Model P-25R are available either with hand or power tilting of the table through a 135-deg angle.

Optional equipment includes a rotating welding current ground device mounted directly upon the table spindle, magnetic starters with limit switch protection for the tilting mechanism and a disengaging clutch on the table rotation system.

THE REED ENGINEERING CO., 1003-17 West Fairview Ave., Carthage, Mo.

* * *



Power Take-Off for Welder

ARC welders, pumps, compressors, saws and other power tools can be operated by means of a new power take-off that can be installed in standard trucks with standard transmissions. Called the "Tangen" power drive, it is claimed to make available 97% of the power of the main drive gear in the transmission.

Power is said to be available whether the truck is in motion or stationary. A governor control permits operating the truck at a desired speed while maintaining rpm in the power drive shaft for auxiliary uses. According to the manufacturer, the power drive can be easily removed from one transmission and installed in another.

MOBILE POWER, INC., 3020 East Grand Blvd., Detroit 2.

* * *

New Hard-Facing Rod

RANITE "C-X" is the trade name of a new hard-facing welding rod for mill hammers and similar parts. Proper application of the new alloy involves slowing of the cooling rate as much as possible and preheating to 570 F, if feasible. It may be used with a-c or d-c, straight or reverse polarity and in any position.

The "C-X" alloy is designed to produce a hardness of 53-57 Rockwell C in the deposit with minimum porosity. The company claims that in many cases it will serve where tungsten-carbide tube rods formerly were necessary. The latter are now expensive and in short supply.

RANKIN MFG. CO., 3072 West Pico Blvd., Los Angeles 6.

* * *

Medical Cylinder Skirt

WHITE cardboard covers are now available for covering cylinders of medical oxygen while they are in use in the hospital room. The cylindrical cover is 2/3 as high as the cylinder and has special flaps that fold in at the top out of the way of the regulator.

For protecting the cylinder paint from scratches and dirt, the cardboard skirts also give an antiseptic appearance. An attractive label or design can be printed on the sides of the cover.

DELTA OXYGEN CO., INC., 611 Court Ave., Memphis 5, Tenn.

* * *

Non-Toxic Dy/Chek

DEVELOPMENT of an improved and non-toxic Dy/Chek formula for dye penetrant inspection of weldments has been completed by Turco Products. The Dy/Chek method consists of applying a red dye to a surface being inspected and allowing it to penetrate into all cracks and crevices for a few minutes before wiping it off. A white "developer" is then applied to the same surface. This white substance seeks out any dye hidden in tiny imperfections and shows it as fine red lines in the whiter surface. Cracks of almost microscopic size can be detected at a relatively low cost and with no special equipment. Good only for surface imperfections, it can be applied to mass production in spection of parts as well as single time checks. No special training of personnel is required either.

TURCO PRODUCTS, INC., Terminal Annex 2649, Los Angeles 54.

Gas-Driven Arc Welder

An end-mounted control panel is featured on a new Hobart gasoline-engine driven d-c arc welder. The new panel position is said to afford easier adjustment of welding variables. On it are located the generator controls, meters, welding and ground cable terminals, polarity switch, ignition switch, starter button, oil pressure gauge and battery ammeter as well as a receptacle for 1 kw auxiliary power.

Control of welding current is accomplished by the large wheel in the center of the panel and a field rheostat inside the wheel. The latter provides 100 steps of fine adjustment in each of ten main ranges of current.

Prompt build-up of voltage and freedom from accidental polarity reversal are assured by a special oversize, built-in 4-pole exciter. This is large enough to supply d-c current for the welder and an excess to operate lights and tools through the auxiliary power receptacle.

The welder is powered by a Chrysler industrial engine whose speed is controlled by a fly-ball type governor. An automatic idler slows the engine after a time-delay when the welding arc is broken and brings it up to speed when welding is resumed. The welder can be stationary-mounted or on a pneumatic tired four wheel trailer.

The Hobart Brothers Co., Hobart Square, Troy, O.

* * *

M & T Hard-Facing Rods

A new line of hard-facing electrodes and acetylene welding rods has been added to the Murex line by Metal & Thermit Corp. The new rods include types developed for extreme abrasion, medium and heavy impact, severe shock, high red hardness and extreme heat and corrosion resistance.

A new Murex tungsten-carbide rod is claimed to produce an exceptionally slag-free weld deposit that is easily cleaned by wire-brushing.

Metal & Thermit Corp., 100 East 42nd St., New York City 17.

* * *

Atomic Hydrogen Welder

Redesign of its atomic hydrogen transformer welder, including a new "hot-start" circuit and silicone insulation, has been announced by General Electric's Welding Dept. An extra-wide current range on the new model of 10 to 100 amp allows the use of a single machine on all applications, says G-E. The current range is divided into two sections, 10 to 35 amps, each extending the entire length of the indicator scale for precise settings. The new design also allows a considerable cost reduction over the superseded atomic-hydrogen model, says G-E.

Use of the silicones means a longer coil life, according to company engineers, and inclusion of a range switch permits changing from one range to another without moving the welding cable. Retained on the new model are such former features as power factor correction capacitors, portable "start-stop" pushbutton, automatic gas shut-off and stepless current control.

The welder operates on 60 cycle single-phase power with a 75 amp rating. It is 41½ in. high, 18¾ in. in diameter and weighs 350 lb.

General Electric Co., Schenectady 5, N. Y.

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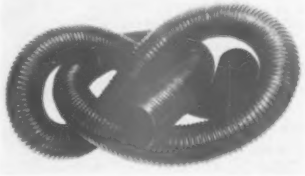


Flexible Ventilating Hose

Neoprene and laminated nylon chafer duck are combined in a new lightweight flexible hose suitable for ventilating welding booths or insides of pressure vessels being welded, carrying off toxic fumes or abrasive dusts. For both pressure and vacuum service the "Flexaust" hose is wire-reinforced and comes in 1½ in. to 24 in. inside diameters.

The American Ventilating Hose Co., 100 Park Ave., New York City 17.

* * *

Flexible Grinding Wheel

A new reinforced, flexible, hub-type grinding wheel is known as the Norton BFR. Norton says the operator can now rough grind, finish grind and notch all with the same wheel.

The wheel is designed for use on right angle or sander-type portable grinders. It is made of carded web material impregnated with abrasive grain. Generally, it will be used to smooth down welds, blend surfaces on contours and notch risers in all kinds of castings. The wheel is said to be light, to be unusually strong and to do a good polishing job.

The new wheel fills in between the well-known but stiffer BD type wheel and the coated abrasive discs manufactured by Behr-Manning Corp. (a Norton subsidiary).

A safety web built into the back of the wheel will hold all the pieces together should the wheel break.

Norton Co., Worcester 6, Mass.

* * *

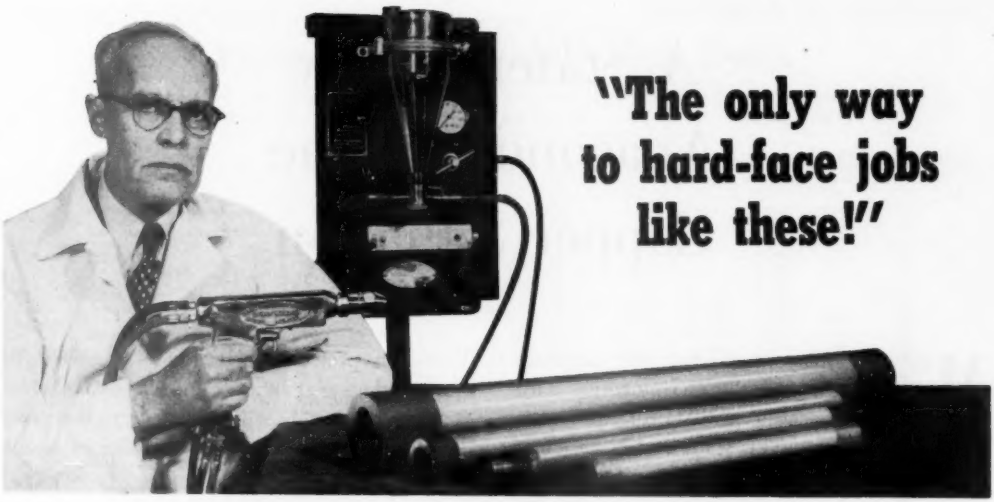
Bare Aluminum Rods

Two new high-purity bare aluminum welding rods have been developed by All-State. The All-State X-43S meets Government specification QQ-R-566 Type 1 Class FS-RAL-43. It is the cleanest of the high purity 43S aluminum rods, says the company.

A high purity 2S aluminum rod is the All-State X-2S that meets QQ-R-56 Type 1 Class FS-RAL-2. It can also be used by all three methods of welding. Both rods come in 1/16 through ¼ in. diameters in standard lengths of 36 in. They also come in coil form in packages of 50 lb.

All-State Welding Alloys Co., Inc., White Plains, N. Y.

(More New Products on page 74)



"The only way to hard-face jobs like these!"

COLMONOY SPRAYWELD PROCESS*

*A process of *welding* sprayed metal

1. *Less Material* is used with the Sprayweld process than with hand welding because the thickness of the overlay is easily controlled to within .010".

2. *Less Time* is required to spray and fuse than to laboriously apply the overlay with a rod. Most time is saved in finishing the work, the Sprayweld application being much closer to finish dimensions than hand welding.

3. A Sprayweld surface *Lasts Longer* because it is dense and smooth, with no pinholes or porosity. Colmonoy alloys, used in Spraywelding, are highly abrasion and corrosion resistant, and give up to 25 times longer life, than original equipment.

SPRAYWELDER IN ACTION

Stainless steel shaft being sprayed with Colmonoy No. 6. This shaft will last 12 times longer than if unfaced. Colmonoy No. 6 has great resistance to wear and corrosion.

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CORPORATION

HARD FACING ALLOYS

19345 JOHN R STREET DETROIT 3, MICHIGAN

COLMONOY is a complete line of hard facing alloys; They have various properties and many forms: rod, wire, powder, paste and castings.

The COLMONOY SPRAYWELDER is the powder metallizing gun, shown left. It provides a simple, low-priced method of applying hard facing alloys to withstand corrosion and abrasion.

This is the SPRAYWELD PROCESS. You *spray* the COLMONOY alloy on, then *weld* it by bringing the overlay to a fusing temperature. Thus COLMONOY Spraywelding combines the advantages of two processes: the *smooth application* of metallizing, with the true *molecular bonding* of welding.

Many *worn* parts, commonly discarded, may now be hard faced the Sprayweld way.

Many *new* parts, commonly made of expensive alloy steel, may now be made of mild steel and Spraywelded with COLMONOY.

The process is essentially three steps:

- Preparing the surface by grit blasting.
- Spraying with the COLMONOY SPRAYWELDER or with other metallizing equipment (using COLMONOY SPRAY WELD WIRE).
- The fusion of the overlay using an oxy-acetylene torch.

WALL COLMONOY CORPORATION
19345 John R Street • Detroit 3 • Michigan

Please send me information about Colmonoy hard facing alloys.

Name _____ Title _____

Firm _____

Street _____

City _____ State _____

A Statement by Anaconda on the Copper Situation

MANY users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems – Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But – before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations – one should know the facts about the future of copper.

New Anaconda projects – The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects – During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually – over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

• • •

These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

92320A

ANACONDA
COPPER MINING COMPANY

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company

PRODUCERS OF: Copper, Zinc, Lead, Silver, Gold, Cadmium, Vanadium, Superphosphate, Manganese Ore, Ferromanganese.

MANUFACTURERS OF: Electrical Wires and Cables, Copper, Brass, Bronze and other Copper Alloys in such forms as Sheet, Plate, Tube, Pipe, Rod, Wire, Forgings, Stampings, Extrusions, Flexible Metal Hose and Tubing.

Ferrous Material Design Data

Material	Spec.	Chemical Analysis		Physical Properties			
		Carbon	Others	Yield Strength	Tensile Strength	Elongation, per cent in 2 in.	Brinell Hardness
Cast iron, gray, Grade 20	ASTM A48-36	3.00–4.00		.....	20,000	..	163
Gray, Grade 30	ASTM A48-36	3.00–4.00		.....	30,000	..	180
Nickel		2.00–3.50	Ni 0.25–0.50	.....	40,000	..	310
Chrome-nickel		2.00–3.50	Ni 1.00–3.00 Cr 0.50–1.00	.....	53,000	..	510
White		2.00–4.00	Si 0.80–1.50	.....	46,000	..	420
Malleable	ASTM A47-33	1.75–2.30	Si 0.85–1.20	35,000	53,000	18	140
Iron, wrought	ASTM A41-30	0.08	Si 0.15 Slag 1.20	26,000	46,000	35	105
Ingot			Fe 99.45	25,000	44,000	30	100
Steel, cast, low carbon		0.11	Mn 0.60 Si 0.40	35,000	60,000	22	120
Medium carbon		0.25	Mn 0.68 Si 0.32	44,000	72,000	18	140
High carbon		0.48	Mn 0.68 Si 0.41	39,000	83,000	15	182
Steel, rolled, carbon	SAE 1010	0.05–0.15		28,000	56,000	35	110
Carbon	SAE 1015	0.15–0.25		30,000	60,000	26	120
Carbon	SAE 1025	0.20–0.30		33,000	67,000	25	135
Carbon	SAE 1035	0.30–0.40		52,000	87,000	24	175
Carbon	SAE 1045	0.40–0.50		58,000	97,000	22	200
Carbon	SAE 1050	0.45–0.55		60,000	102,000	20	207
Carbon	SAE 1095	0.90–1.05		100,000	150,000	15	300
Nickel	SAE 2315	0.10–0.20	Ni 3.25–3.75	90,000	125,000	21	230
Ni-Cr	SAE 3240	0.35–0.45	Ni 1.50–2.00 Cr 0.90–1.25	113,000	136,000	21	280
Moly	SAE 4130	0.25–0.35	Cr 0.50–0.80 Mo 0.15–0.25	115,000	139,000	18	280
Cr	SAE 5140	0.35–0.45	Cr 0.80–1.10	128,000	150,000	19	300
Cr-Va	SAE 6130	0.25–0.35	Cr 0.80–1.10 Va 0.15–0.18	125,000	150,000	18	310
Si-Mn	SAE 9260	0.55–0.65	Mn 0.60–0.90 Si 1.80–2.20	180,000	200,000	12	390

Effects of Alloys in Steel

Element in Steel	Effect
Aluminum	Deoxidizer
Carbon	Hardness
Chromium *	Shock strength
Cobalt *	Strength
Copper	Hardness
Manganese *	Strength
Molybdenum *	Heat resistance
Nickel *	Toughness
Oxygen	Weakens
Phosphorus	Weakens
Silicon *	Hardens
Sulphur	Weakens
Titanium	Deoxidiser
Tungsten	Hardens
Vanadium	Fatigue resistance

* These elements also tend to increase strength.

Weldability of Metals

Metal or Alloy	Arc	Gas	Resistance
Cast iron	B	B	D
Malleable iron	B	B	D
Wrought iron	A	A	D
Ingot Iron	A	A	A
Low-carbon steel	A	A	A
Medium-carbon steel	A	A	A
High-carbon steel	A	A	A
Alloy steel SAE 2115	B	B	B
SAE 3135	B	B	B
SAE 3140	C	C	D
SAE 4140	B	B	D
Stainless steel 301	B	B	A
304	A	B	A
316	A	B	A
347	A	B	A
403	B	B	B
420	B	X	B
430	B	X	B
446	B	X	B
501	B	X	B
502	B	X	B

A—readily welded; B—weldable under favorable conditions; C—not ordinarily weldable; D—no welding data available; X—gas welding may be applied successfully under certain conditions, usually 20 ga. or lighter

Uses for Steel by Carbon Content

Carbon Class	Carbon Range, per cent	Use
Low	0.05–0.15	Chain, nails, pipe, rivets, screws, sheets for pressing and stamping, wire
	0.15–0.30	Bars, plates, structural shapes
Medium	0.30–0.45	Axles, connecting rods, shafting
High	0.45–0.60	Crankshafts, scraper blades
	0.60–0.75	Automobile springs, anvils, bandsaws, drop hammer dies
Very high	0.75–0.90	Chisels, punches, sand tools
	0.90–1.00	Knives, shear blades, springs
	1.00–1.10	Milling cutters, dies, taps
	1.10–1.20	Lathe tools, woodworking tools
	1.20–1.30	Files, reamers
	1.30–1.40	Dies for wire drawing
	1.40–1.50	Metal cutting saws

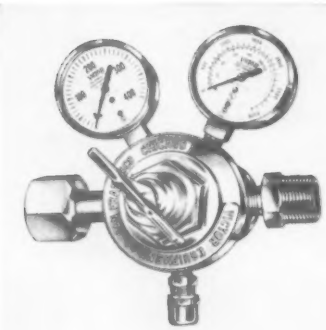
Typical Cast Iron Analysis by Use

Application	C	Si	Mn	P	S	Ni	Cr	Mo
Automotive								
Cylinder block	3.25	2.25	0.65	0.15	0.10			
Cylinder block Ni-Cr	3.25	2.25	0.65	0.15	0.10	0.75	0.30	
Pistons, Mo	3.35	2.25	0.65	0.15	0.10			0.60
Piston rings	3.50	2.90	0.65	0.50	0.50	0.06		
Caustic pots	3.60	1.00	0.75	0.20	0.07			
Compressors								
Cylinders, Cr-N	3.30	2.10	0.55	0.25	0.10	1.25	0.45	
Cylinders, N	3.00	1.10	0.80	0.20	0.10	2.00		
Forging dies, Cr-Ni	3.00	1.25	0.60	0.20	0.10	2.75	0.80	
High strength	2.75	2.25	0.80	0.10	0.09			
High strength, Ni	2.75	2.25	0.80	0.10	0.09	1.00		
High strength, Mo	2.75	2.25	0.80	0.10	0.09			0.35
Ingot molds	3.50	1.00	0.90	0.20	0.07			
Plowshare	3.60	1.25	0.55	0.40	0.10			

From "Introduction to Mechanical Design" by T. B. Jefferson and W. J. Brooking, Ronald Press, 1951.

THE MAN ON THE JOB . . .

WANTS VICTOR'S STEADY FLAME !



Precision-built, long-wearing VICTOR Safety Regulators are made for almost every gas and use, for pressures up to 5000 p.s.i., and volumes to 2000 c.f.m.

VICTOR Safety Regulators give the man on the job the even gas flow he needs for efficient work. They hold setting over the entire pressure range, right down to the bottom of the cylinder, without time-wasting adjustments . . . enable your operator to do a better job faster.

See for yourself how VICTOR Safety Regulators reduce costs by saving gas and labor, the big items in any welding or cutting job. Phone your VICTOR dealer for a demonstration TODAY.

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FREE LITERATURE—

Catalogs • Booklets • Bulletins

A Welding Engineer Reader Service

1 CONTOUR SHEAR—Baker Brothers, Inc., Toledo 10, O. 4-page bulletin No. 849 shows in five clear pictures versatile circle cutting, shape cutting, beading, forming and flanging operations the "Tru-Edge" Contour Shear can make in steel, aluminum, brass, fibre, expanded metal, paper, etc. Descriptions of all operations and optional equipment are included. See page 44.

2 HARD-FACING ROD—Rankin Mfg. Co., Los Angeles 6. Single sheet bulletin on Ranite C-X describes its application as a hard-facing on mill hammers, and similar equipment. How it can replace tube tungsten rods is explained as well as its special application requirements such as preheat and slow cooling. See page 46.

3 CAST WELDING FITTINGS—The Key Co., East St. Louis, Ill. 4-page two-color bulletin furnishes pictures and sketches of new "Key-Kast" alloy steel welding fittings. Subjects covered are extra thicknesses of walls, bosses for tapped openings, lower unit cost, controlled quality and adherance to codes. Elbows of various degrees, concentric and eccentric reducers, laterals, crosses and flanges are shown.

4 WELDING FLUXES—Anti-Borax Compound Co., Inc., Fort Wayne 6, Ind. 8-page pocket-size folder lists 14 types of proved fluxes for steel, aluminum, magnesium, stainless steel, cast iron, burnt cast iron, brass and malleable iron. Melting characteristics and heats are included.

5 17-CHROMIUM STAINLESS—Armco Steel Corp., Middletown, O. Where to use 17 chrome stainless steel as an alternate for 18-8 and how to fabricate it are the subjects of new Armco publications. The first tells various properties, what care to give it, questionable applications. Fabricating data bulletin gives welding instructions, mechanical properties of arc and spot welds, changes in die practice, etc.

6 PORTABLE CUTTING MACHINE—Air Reduction Sales Co., New York 17. 8-page, two-color folder shows the No. 20 "Radiagraph" portable flame cutting machine with all parts identified. Applications in circle cutting, beveling, contour cutting, removal of flanges, splitting webs are also shown. See page 45.

7 GRINDER MAINTENANCE—The Rotor Tool Co., Cleveland 12. 12-page bulletin 39 gives valuable instructions for proper care of 180 and 360 cycle electric grinders. Subjects covered in readable fashion include: periodic inspection, lubrications, ball bearings, stators, spare parts and safety. For the electrical engineer there is a special section on switches, cables, power supply, shorts and grounds and single phasing.

8 PRESS BRAKES—Airtherm Mfg. Co., St. Louis 10, Mo. 12-page catalog 907 gives specifications of Airtherm "Metalworker" series PB, 1500 and 2000 press brakes. Construction, capacity in metal thickness, dimensions and optional features are pictured and explained.

HOW TO ORDER: Fill out one of the small card sections completely (name, address, your company, etc.) for each piece of literature you would like to have. Each card section must be completely filled out; do not use ditto marks. Each circle must contain the number that appears with the item on which you desire further information.

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9 VISE & CLAMP—American Implement Co., Omaha, Nebr. Bulletin describes the versatile "Multi-Vise," a 28-lb steel vise that also is an efficient welding clamp, welding positioner, pipe wrench and drill jig. Photos show construction and various uses in welderies and machine shops.

10 AIR EXHAUSTER—Mine Safety Appliances Co., Pittsburgh 8. 4-page bulletin DP-5 tells all about the Lamb "Air Mover," a bell-shaped portable ventilating device that employs only a compressed air or steam line to blow or exhaust large quantities of air or fumes. See page 78.

11 TUBE BENDER—The Imperial Brass Mfg. Co., Chicago 7. Single sheet bulletin tells about a "2-in-1" bender that will bend both ½ and ⅝-in. tubing without changing shoes. Pictures show operation and explain its construction. Bulletin also pictures tube cutters, flaring and swedging tools.

12 AUTOMATIC SOLDERING—Metallizing Company of America, Chicago 24. 8-page brochure gives a review of the Mogul automatic soldering and brazing equipment for production lines. Sample setups of soldering and brazing guns are not only explained but sketched. Gases and equipment are discussed.

13 NON-FUSION WELDING—Eutectic Welding Alloys Corp., Flushing, N. Y. 8-page reprint of a technical paper, "Dilution and Diffusion Aspects of Non-Fusion Welding" given at AWS convention in 1951 is profusely illustrated and documented with charts, diagrams, tables and formula derivations.

14 NON-FLAMMABLE HYDRAULIC FLUID—Monsanto Chemical Co., St. Louis 4, Mo. 12-page booklet gives in detail the properties and performance of "Pydraul F-9" a nonflammable hydraulic fluid for die-casting machines, hydro-electric turbines, hydraulic presses and resistance welding machines.

15 WELDED STEEL BUILDINGS—Air Reduction Sales Co., New York City 17. Reprint from *Engineering News-Record* carries two articles run in that magazine, "Welding Trims Steel From Heavy Trusses" by La Motte Grover and Gilbert D. Fish, and "Welding a 10-story VA Hospital" by R. A. Phelps.

16 GRINDING CATALOG—Hammond Machinery Builders, Inc., Kalamazoo, Mich. 20-page, two-color catalog covers the complete Hammond line of abrasive belts and wheels, grinding, polishing and buffing machinery. Grinding accessories and dust collectors are also pictured and described.

17 AIRCOMATIC WELDING—Air Reduction Sales Co., New York City 17. Three new reprints of articles from *The Welding Journal* on "Aircomatic" welding are numbered ADR 75 "Inert-Gas-Shielded Metal-Arc Welding of Magnesium," ADR 76 "Aircomatic Welding Refinery Components and Pressure Vessels" and ADR 77, "Aircomatic Welding of Austenitic Stainless Steels."

18 WELDING COPPER—Ampco Metal, Inc., Milwaukee 46. 4-page quarterly tells how welding of copper alloy sulphuric acid sludge tanks was done. Other subjects include new resistance welding techniques and case histories of overlaying electric furnace trunnion shafts and cast iron with "Ampco-Trode" electrodes.

19 DUST COLLECTOR—Torit Mfg. Co., St. Paul 2, Minn. New 24-page catalog tells about cabinet and cyclone-type dust collectors for grinding installations and similar spots in factories. Also shown are a complete line of fittings and accessories and a series of blueprint sketches giving overall dimensions of each collector.

20 ELECTRONIC TUBES—Milo Radio and Electronics Corp., New York City 7. 28-page catalog furnishes technical specifications and information on hundreds of special purpose electronic tubes (such as ignitrons for welder controls) used in control, processing, production, research, counting, weighing, etc.

21 ARC WELDING—Hobart Brothers Co., Troy, O. 16-page booklet contains interesting photos and articles on welding all over North America.

22 POWER TAKE-OFF—Mobile Power, Inc., Detroit 2. 4-page bulletin tells about the Tangen power drive for operating welders, pumps, generators, etc. Sketches show how drive is simply installed in stand-and truck transmissions. See page 45.

23 BATTERY CHARGER—Motor Generator Corp., Troy, O. 6-page folder tells about complete line of automatic motor generator chargers for industrial electric lift and transporting equipment. Principles of operation of batteries are included.

24 SAFETY TOOLS—Ampco Metal Inc., Milwaukee 46. 4-page booklet tells about Ampco spark-resisting safety tools such as wrenches, chisels, scrapers, knives, screw drivers, shovels, pliers, etc. made of Ampco metal, Ampco beryllium copper or Ampco Monel. Openings, capacities and dimensions are given for each tool.

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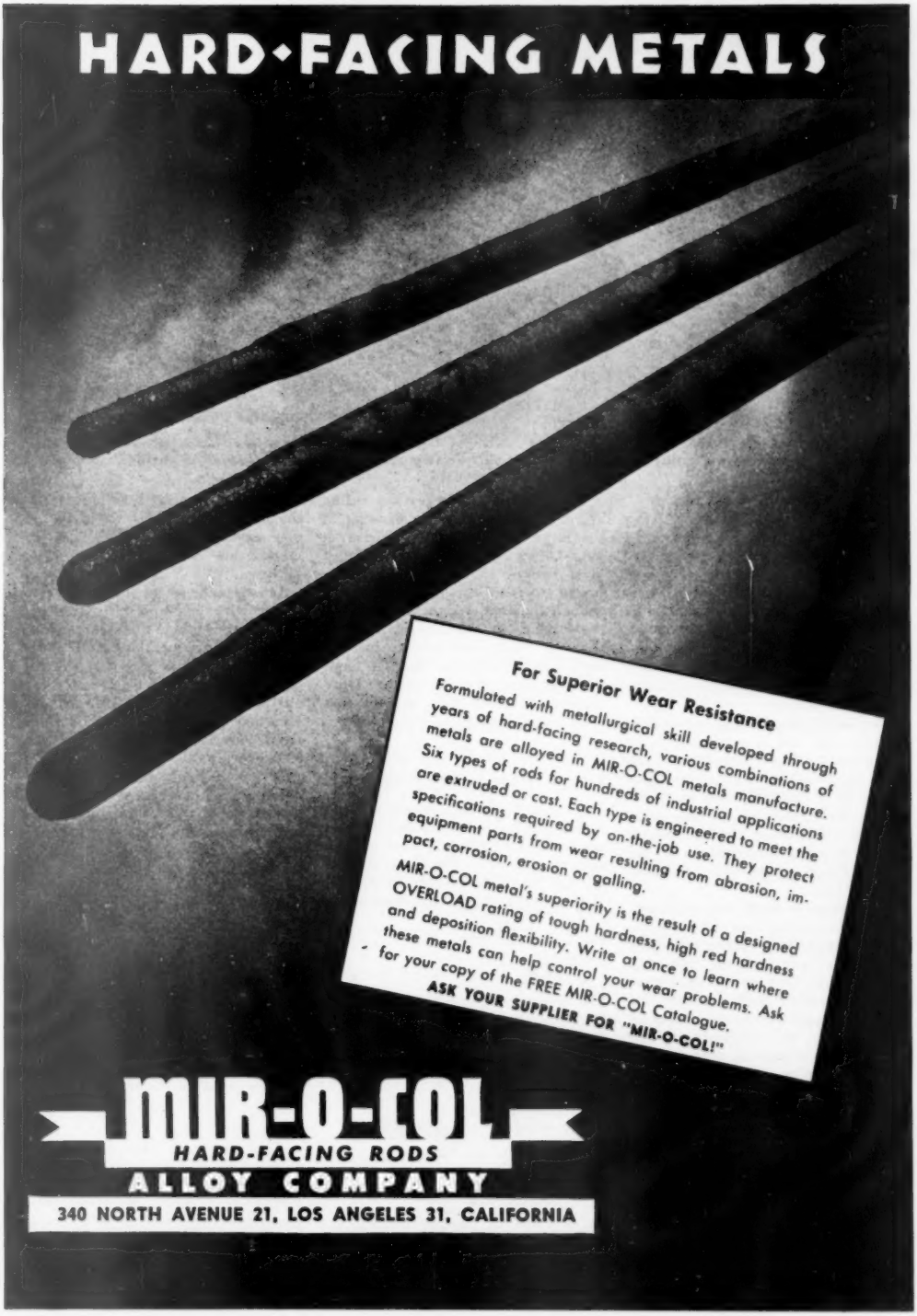
HARD-FACING METALS



For Superior Wear Resistance

Formulated with metallurgical skill developed through years of hard-facing research, various combinations of metals are alloyed in MIR-O-COL metals manufacture. Six types of rods for hundreds of industrial applications are extruded or cast. Each type is engineered to meet the specifications required by on-the-job use. They protect equipment parts from wear resulting from abrasion, impact, corrosion, erosion or galling.

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HARD-FACING RODS
ALLOY COMPANY
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on the job . . .

TEST equipment placed to measure strains in walls of welded turbine scroll casing while under pressure

Courtesy Linde Air Products Co.

BIG CASTING for spur gear blank is trimmed by cutting machine that rides around a circular track plate

Testing 130-Ton Weldment

A 260,000-LB turbine scroll casing made of seven welded sections of heavy steel plate was recently given strain-gage tests at the Baldwin-Lima-Hamilton Corp. plant in Philadelphia. The scroll casing is for a 70,000-hp turbine, two of which are being installed at the Detroit Dam (Ore.) power plant of the Corps of Engineers, U. S. Army.

The strain gages and indicators used in the test were products of Baldwin's testing department. The gages were bonded by standard procedure at 17 critical points along the 1⅝-in. walls, including welds, areas between welds, areas in fillets and on the three-point intersection of the bolting flange, rolled plate and stay ring casting.

Since these strength tests were performed in conjunction with hydrostatic leakage tests, moistureproofing with cerese wax was the first step necessary. An area around each gage was then covered with a waterproof paper, in turn sealed to the casing by means of 2-in. wide surgical tape. The whole was then painted over with an alkyd resin paint.

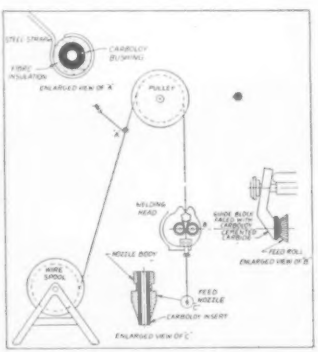
The casing itself was sealed by means of a 150-in. drum head on the intake end and by a barrel ring on the inside bore of the stay ring casting. Test pressures of 95, 190 and 285 psi were applied by pump and shop accumulator system. Seven strain measurements were made with each gage at each pressure. Zero readings were repeated on each measurement and were found to return to within plus or minus 5 micro-inches.

Maximum diameter of the casing spiral is 40 ft., and the opening at the large end is 150 in. The seven shop-welded sections are equipped with flanges to allow them to be bolted together in the field. Even though the total weight is 130 tons, the casing is considerably lighter than its equivalent design in cast steel would have been. Baldwin engineers estimate that the weight saving amounts to 20 to 30% and the cost savings to 15 to 20%.

* * *

Longer Wear in Arc Welding

THE NOZZLES through which welding wire is fed for automatic arc welding are usually of brass and wear out at a rather rapid rate. The General Electric Co. licked the problem at its Fort Wayne, Ind., works by inserting a bushing of cemented carbide inside the nozzle tip (detail "C" in the accompanying sketch). This has increased life of the nozzle tips up to 20 times.



SKETCH shows three improvements in automatic arc welding effected by cemented carbide ("A", "B", "C")

In one case where the coiled electrode wire is especially abrasive, brass nozzles had to be replaced six to eight times a week. The carbide-protected nozzles are giving a service life of three months and better. On other operations where former life had not exceeded three weeks, the carbide nozzles are lasting as long as a year. Moreover, a more uniform narrow weld can be maintained because accurate guidance of the wire—difficult to attain after wear develops—is no longer a problem. The use of carbide-equipped nozzle tips has been made standard on about 20 automatic arc-welding machines.

To reduce downtime and maintenance still further, two other improvements have been made with cemented carbide. A carbide guide ring (detail "A" in sketch) was added inside the fibre guide that keeps the electrode wire from riding off the overhead pulley. This minimizes the danger of short-circuits due to the fire wearing through the fibre insulation and coming into contact with the metal supporting arm.

The other application was at the guide block that locks the electrode wire in position against the conical feed rolls (detail "B" in sketch). Wear occurring at this point impaired the positive electrode feed. The guide block is now tipped with a cemented carbide blank, the face of which has been ground to a slight curvature.

Slicing Off 14-in. Risers

(See right picture on page 54)

BY MOUNTING a heavy-duty cutting torch on a mechanized carriage, risers are rapidly removed from steel castings for spur gear blanks at a midwestern foundry. The cutting machine rides on a circular track plate and is guided by a radius rod attached to a permanently located center point. The torch easily lops off the 14-in. wide risers at a rate of 5½ ipm.

The risers are first severed in the horizontal plane, as shown in the accompanying picture. The same apparatus is then used to shave off the riser feet from the periphery of the casting. The only change that has to be made in the set-up is to adjust the bevel cutting adaptor in order to relocate the cutting tip in the vertical position.

The use of an oversize tip at a low oxygen pressure has been found to produce smoother surfaces and cutting at higher speeds.

* * *

Anti-Fumbling Device

(See picture below)

THEY don't drop shafts any more at The National Supply Co.! This Torrance, Calif., manufacturer of oil-field machinery, has devised a drop-proof lifting aid—a short piece of large-diameter pipe on which is welded a hook and handle. One of these is placed over each end of the shaft before lifting (see picture below). The open end of the holding device is flared to make it easier to position the shaft inside.

SIMPLE idea saves trouble when heavy shafts are lifted by crane

Less Production Delay With Bridgeport No. 192 Low Fuming Bronze Rod

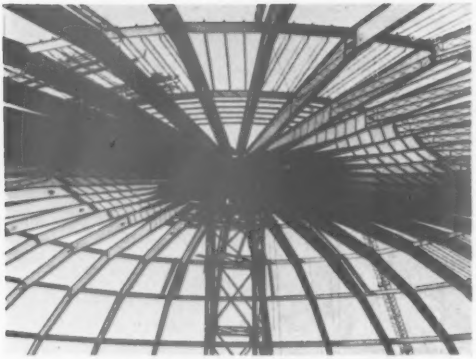
Making quick, reliable repairs on broken cast iron and steel equipment means less interruption in vital production. Every welder should be thoroughly familiar with the advantages of braze-welding. Instead of costly delay and expensive replacement, broken or cracked equipment is back in normal service quickly, when repairs are made with one of Bridgeport's Bronze Welding Alloys.

Aside from quick repairs of broken metal parts, braze welding alloys are excellent production tools for sheet metal work, tanks, agricultural implements and for putting hard tips on tools.

Write for your free copy of Bridgeport's booklet "Bronze Welding Alloys."

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS



ARC WELDED DOME is world's largest of shallow-type construction. The 36 welded ribs are 110 ft long

DECORATIVE Denise Darcel, "Miss Weldor of 1952" receives scroll from Eutectic president R. D. Wasserman

NEWS

Special Auto Race for IAA at Indianapolis March 31

Lively plans for the 1952 annual convention of The International Acetylene Association at Indianapolis March 31, April 1-2 include a special 25-mile auto race at the world-famous Indianapolis Speedway. IAA members and guests and students and faculty from Purdue University and Rose Polytechnic Institute will also make an inspection trip to the Speedway Plant of Linde Air Products Co.

Opening event of the convention will be a luncheon Monday March 31 at the Hotel Claypool. Dean Clarence E. Mannion, College of Law, Notre Dame University, will be guest speaker. At this time the James Turner Morehead Medal, awarded annually by the IAA, will be presented.

Following lunch, there will be two technical sessions, of interest to both university students and faculty as well as industrial delegates. Papers on the chemical uses of acetylene and industrial applications of the oxyacetylene flame will be presented.

A special student session at 7:30 in the evening will be highlighted by the showing of the IAA motion picture, "The Oxyacetylene Flame — Master of Metals." A panel talk on the employment possibilities in oxyacetylene welding and cutting will be presented at this time by prominent members of industry and education in the Midwest.

The inspection trip of the Linde plant and the special race at the Speedway, if held, will take up Tuesday. On Wednesday morning the annual business meeting and election of officers will be held.

All sessions of the convention except the business meeting and a special closed session on industry problems will be open to the public and there will be no registration fee.

* * *

225-Ft. All-Steel Dome Erected by Welding

ARC welding proved to be the answer to many problems encountered in erecting the world's largest all-steel shallow-type dome at the newly completed Jordan Marsh Store near Boston, Mass.

Diameter of the dome is 225 ft and is formed by 36 welded steel ribs that are 110 ft long each. The ribs were fabricated and checked in the shops of the A. O. Wilson Structural Co., Cambridge, Mass. A. O. Wilson used more than 8,000 lb of E-6010, F-6020 and E-6011 electrodes to join the 400 tons of structural steel. Erection time for the dome was 12 weeks.

Ring girders, 36-in. deep and weighing 300 lb per ft, were installed around the base of the building to support the big steel ribs which meet at the top of the dome in a 14-ft hub. The contour of the dome was achieved by making each rib in five sections. The 30-in. high sections were beveled at the ends and welded with 200-amp motor-driven welders to make the 110-ft length.

A 60-ft tower was erected to raise the ribs and weld them to the hub at the center. Space was crowded at the center of the hub so a plywood floor piece was fitted between the rings to support the welding operators. Field welding was done with three 300-amp gasoline-engine-driven welders.

* * *

"Miss Weldor of 1952" is Actress Denise Darcel

BEAUTEOUS Denise Darcel, M-G-M movie stage and television star was officially named "Miss Weldor of 1952" by the national Eutectic Weldor's Club at a luncheon at New York's Roosevelt on Feb. 15. Rene D. Wasserman, president of the Eutectic Welding Institute and of Eutectic Welding Alloys, Inc., Flushing, N. Y., presented a scroll to Miss Darcel.

She was chosen as "the girl we would like most to weld with" by the group of weldors attending Eutectic's school for teaching welding methods with "Low Temperature Welding Alloys."

Her selection was the result of the weldor's heartfelt recognition of her "outstanding qualities of beauty, physical charm, poise, determination, endurance, meticulousness, emotional stability, ready wit and unselfishness."

Besides Miss Darcel's appearance, guests were treated to a demonstration of a new Eutectic product, "Chamfer-Trode." It is claimed highly efficient for cutting or gouging steel, with the added advantage of leaving the metal relatively cool.

stoody hard-facing wires

	PROPERTIES	OPERATING CHARACTERISTICS	APPLICATIONS	WIRE SIZE
STOODY 101	Rockwell C — 34-36 Abrasion Resistance—good Impact Resistance—high Corrosion Resistance—good Heat Resistance—good to 800° F Deposits machineable with carbide tools.	Submerged Arc Amperage for 5/32" wire—300-450 Voltage—28-30 Travel Speed—15"-35" per minute Preheat to 600° F to minimize checks.	Pump parts subject to corrosion Bearing Surfaces Large Valves Roll Necks	1/8" 5/32" 3/16"
STOODY 102	Rockwell C — 50-52 Abrasion Resistance—good Impact Resistance—good Sound deposits, excellent weldability. Designed for multiple pass application.	Submerged Arc Amperage for 5/32" wire—300-450 Voltage—28-32 Travel Speed—15"-50" per minute Preheat large cylindrical work to 800° F where deposit must have minimum amount of defects.	Coiler Rolls Pinch Rolls Table Rolls Tractor Idlers Cereal Rolls Shovel Idlers Tool Joints	5/32" 3/16"
STOODY 103	Rockwell C — 52-56 Abrasion Resistance—high Impact Resistance—good Corrosion Resistance—fair For applications involving severe abrasion. This alloy is similar to Stoodite.	Submerged Arc Amperage for 3/16" wire—350-500 Voltage—28-32 Travel Speed—15"-40" per minute Deposits will have some surface checks.	Dredge Ladder Rolls Dredge Impeller Bushings Pipe Sizing Dies Steel Mill Twist Guides Crushers, Gyratory & Gyrosphere	1/8" 5/32" 3/16"
STOODY 105	Rockwell C—46-48 Abrasion Resistance—good Impact Resistance—high Designed for multiple pass application. Deposits machineable with carbide tools.	Submerged Arc Amperage for 5/32" wire—300-450 Voltage—28-32 Travel Speed—15"-45" per minute Preheat large cylindrical work to 600-700° F to minimize defects. No preheat necessary where base metal is less than 1/2" thick.	Tractor Rollers Tractor Idlers Shovel Rollers Sheave Wheels Arch Wheels	1/8" 5/32" 3/16"
STOODY 106	Rockwell C — 38-42 Abrasion Resistance—moderate Impact Resistance—high Sound deposits and excellent weldability. Designed for multiple pass application. Deposits machineable with carbide tools.	Submerged Arc Amperage for 5/32" wire—300-450 Voltage—28-32 Travel Speed—24"-45" per minute Preheat large cylindrical work to 800° F where deposit must be without defects.	Roll Necks Crane Wheels Pump Sleeves Cable Drums Shafting Run out Table Rolls Clutch and Braking Surfaces	1/8" 5/32" 3/16"
STOODY 107	Rockwell C — 38-41 Abrasion Resistance—good Impact Resistance—high Excellent weldability with sound deposit if bead lap maintained on 1/8" step-over. Deposits machineable with carbide tools.	Submerged Arc Amperage for 5/32" wire—300-450 Voltage—28-32 Travel Speed—24"-45" per minute 600° F preheat beneficial.	Mine Car Wheels Leveler Rolls Undercoats for higher alloy deposits	5/32" 3/16"
STOODY 121	Rockwell C—50-54 Abrasion Resistance—high Impact Resistance—fair Corrosion Resistance—fair Metal very fluid during submerged arc application. May be applied open arc DC as well as submerged arc. Similar to manual Stoody Self Hardening 21.	Open Arc—DC only. Submerged Arc—AC or DC Settings for 3/16" wire— Open Arc—300-300 Amps. 28-24 Volts Submerged Arc—350-450 Amps. 28-32 Volts Travel Speed— Open Arc 16"-24" per minute Submerged Arc—12"-35" per minute Preheat in accordance with good welding practice.	Crusher Rolls Scraper Blades Crusher Mantles & Liners Auger Flights Crushers, Gyratory & Gyrosphere Grizzlies	1/8" 5/32" 3/16" 1/4"
STOODY 122	Rockwell C — 51-53 Abrasion Resistance—high Impact Resistance—good Similar to manual Stoody Self Hardening.	Submerged Arc Amperage for 3/16" wire—350-500 Voltage—28-32 Travel Speed 15"-40" per minute Checked deposits will not flake or spall. Checks can be minimized by preheating.	Dredge Screen Rolls Scraper Blades Dozer End Bits Roll Crushers	5/32" 3/16"
STOODY 130	Moh's Scale—9.10 (Borium Particles) Abrasion Resistance—the maximum obtainable. Similar to manual Electric Tube Borium. Heterogeneous deposits of Borium particles in steel matrix.	Open Arc—DC only Amperage for 3/16" wire—190-230 Voltage—16-24 Travel Speed—6"-24" per minute Best distribution of carbide particles from low voltage application. Single pass application. Preheat to eliminate checks.	Tool Joints Scraper Blades Augers Grader Blades	1/8" 30-40 5/32" 20-30 3/16" 10-20 1/4" 10-30

STOODY COMPANY

STOODY COMPANY will gladly supply detailed information on or a list of competent shops near you having automatic hard-facing facilities. Or ask your Stoody Dealer listed under "Welding Equipment and Supplies" in the Yellow Classified Directory. Literature is available from both dealer and factory.

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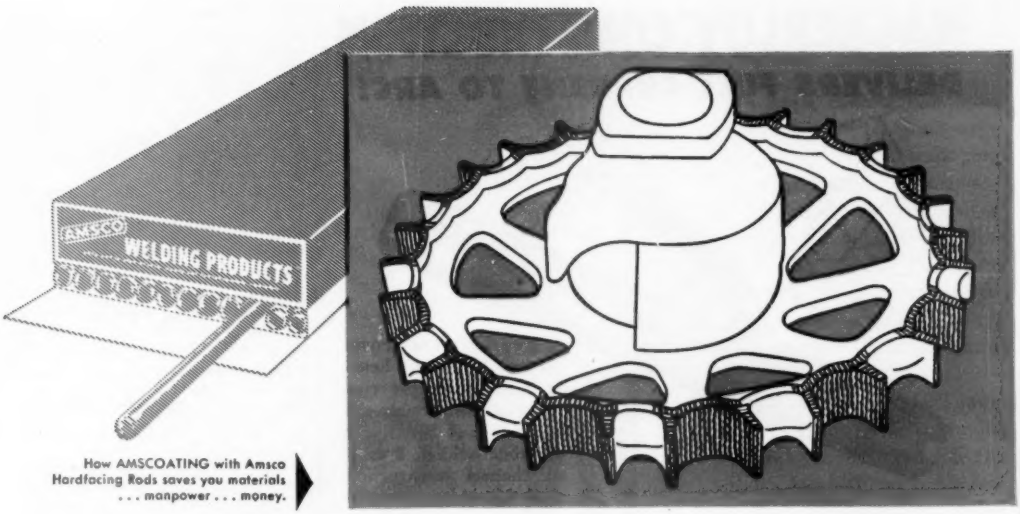
Spot and Arc Welding Papers at Detroit Conference April 16-18

QUALITY control, military specifications, power supply, controls and arc phenomena are among the many subjects to be covered in technical papers at the Third Annual Welding Conference at Detroit, April 16-18. The meetings at the Rackham Memorial Building are sponsored by the American Welding Society, the American Institute of Electrical Engineers and the Industrial Electrical Engineers Society of Detroit.

Tentative program for the three days has been announced by E. J. Limpel, A. O. Smith Corp., Milwaukee. Quality control is the theme of the Wednesday morning, April 16, papers. F. H. Matthews, Boeing Airplane Co., Seattle, will talk on elements of quality control in spot welding aircraft aluminum. Military aircraft spot and seam welding specifications will be discussed by J. Maltz and N. E. Promisel, Bureau of Aeronautics, Navy Dept., Washington, D. C. Two addresses on "Industry's Answer to ANW Specifications" will be presented by P. Gordon Parks, Solar Aircraft Co., Des Moines, and F. Brandt, Thomson Electric Welder Co., Lynn, Mass.

Instrumentation will be the central interest in Wednesday afternoon's papers. Reidar P. C. Rasmusen and Robert McMaster, Battelle Memorial Institute, Columbus, O., will talk on the past, present and future of resistance welding instrumentation as applied to quality control. Instruments for improving single-phase and three-phase resistance welding will be discussed by William R. Stern, Brush Development Co., Cleveland. V. H. Kraybill and R. E. Young, Public Service Co. of Northern Illinois, and M. Fisher, Jr., University of Illinois, will review new devices for measurement of welder voltage drops on power systems. Herbert D. Van Sciver, the Budd Co., will talk on spotweld monitoring by resistance changes. Last paper of the day will be on electronic controls for monitoring resistance changes during a spot weld and will be given by S. S. Barnhart and W. B. Hills, General Electric Co., Schenectady, N. Y.

Various aspects of electric power supply will take up the Thursday morning technical session after introductory remarks by E. L. Bailey, Chrysler Corp., Detroit. First paper of the day will be presented by W. G. Bostwick, Precision Welder & Machinery Co., Cincinnati, on ratings and characteristics of resistance welding machine loads. A power company's viewpoint of power supply for resistance welders will be given by



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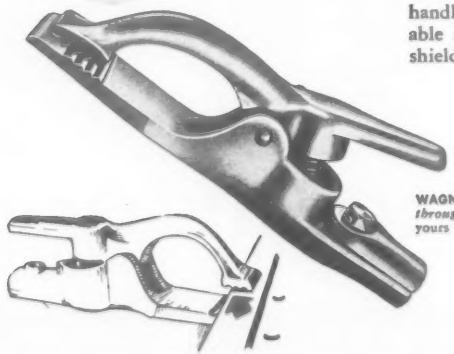

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H. W. Tietze, Public Service Electric & Gas Co. of New Jersey. Title of the talk by W. K. Boice, General Electric Co., New Haven, Conn., will be "Synopsis of Users Section—Information for Power Users." Typical resistance welding installations will be reviewed by C. E. Pflug, Nash-Kelvinator Co., Kenosha, Wis.

Thursday afternoon's speakers will also cover resistance welding. I. W. Johnson, General Electric Co., will talk on up-and-down slope in spot welding. Prof. E. E. Moyer and W. F. Savage, Renssalaer Polytechnic Institute, Troy, N. Y., will describe a new method of controlling platen displacement versus time during flash welding. Last paper of the day will concern problems and equipment in aircraft spot welding and will be given by J. R. Fullerton, Ryan Aeronautical Corp., San Diego, Calif.

Fundamental arc welding studies is the general topic for Friday morning, April 18. First paper of the session is scheduled to be presented by T. B. Jones and Merrill Skolink, Johns Hopkins University. Forces of electromagnetic origin in the welding arc will then be discussed by W. J. Green, research laboratory, Air Reduction Co. How to use high-speed photography as a technique for arc research will be presented by R. J. Krieger, Ohio State University. L. P. Winsor, Renssalaer Polytechnic Institute, will tell about new instruments for studying welding arcs.

The last technical session of the Conference will start Friday afternoon with a talk on the consumable electrode arc in inert gas by R. W. Tuthill, General Electric Co., Fitchburg, Mass. An arc welding process for making electrical connections between small aluminum wires will be explained by C. R. Dixon and Paul Dickerson, Aluminum Co. of America, New Kensington, Pa. Final paper of the session and of the meeting will be on qualitative instrumentation for d-c arc welding and will be given by E. H. Wilhelm, electrical engineer.

* * *

New Hanna Distributor

HANNA Engineering Works, Chicago, has appointed Power Transmission Products Division of Portland Iron Works, Portland, Ore., as distributor for Hanna pneumatic and hydraulic cylinders and valves. Territory will include the state of Oregon and certain counties in California and Washington.

Guy B. Arthur is sales manager of Power Transmission Products, whose address is 1107 N. W. 14th Ave., Portland 9, Ore.

Give your welder a chance to be proud of his footage!

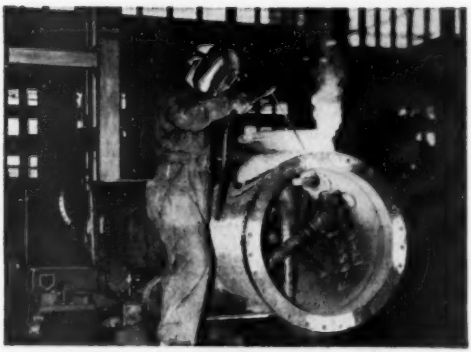
It's *waste welding time* when welders have to climb over, prop up or flop the work piece to get at the different seams.

It's *all arc-time* when Worthington-Ransome Turning Rolls and Welding Positioners are used. All welds can be tilted or turned into position—without delay—for continuous downhand welding.

Result—up to 50% more footage, *better* welds (using higher current and heavier rods), less welding rod waste.

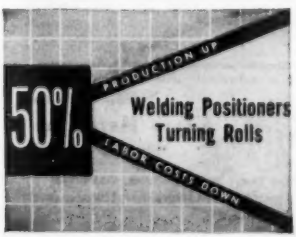
Write Worthington Pump and Machinery Corporation, Dunellen, New Jersey, for bulletins or additional information.

With one set-up, work piece may be tilted and rotated for either automatic or manual welding. Welding Positioner capacities from 100 lb to 30 tons.

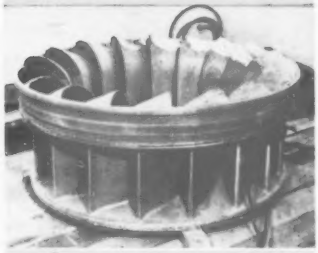


Production goes up on manual or automatic welding, whether repetitive or job work. Turning Rolls from 3 to 150 tons, stationary or self-propelled.

WORTHINGTON



"Bronze-Facing" with Ampco* Electrodes Saves $4800



4-ton turbine runner "Bronze-Faced" with Ampco Electrodes.

Cavitation and erosion caused severe wear on the buckets and blades of this large 4-ton turbine runner. A new runner costs $6000. "Bronze-Facing" with Ampco Electrodes cost only $1200 — a savings of $4800!

Better Than New!

"Bronze-Facing" with Ampco Electrodes is used throughout industry to increase service life, provide superior bearing qualities, obtain improved resistance to wear and keep costs down . . . production up.

You too can save time and money by using Ampco Electrodes in your repair and maintenance operations. Get a supply today from your Ampco distributor, or write us.

Power company personnel preparing turbine runner for "Bronze-Facing" with Ampco Electrodes.

W-154

AMPCO

Ampco Metal, Inc.
Milwaukee 46, Wis.
West Coast Plant, Burbank, California

It's Production-Wise to Ampco-ize!
*Reg. U. S. Pat. Off.

LARGEST GRINDING wheel ever made is this 67 by 69-in. monster. The 10½-ton wheel was made of silicon carbide by the Norton Co. for a British Columbia paper mill. It will grind wood into pulp for newsprint paper. 5,000 hp will be needed to drive this pulpstone at 5,000 surface fpm.

$75,000,000 Piping Job for M. W. Kellogg Weldors

FIELD welding and erection of process and auxiliary piping and equipment will be handled by M. W. Kellogg Co. in the Atomic Energy Commission's two gaseous diffusion plants at Paducah, Ky. The $75,000,000 contract covers processing sections that are considered the most complex ever designed. Resistance to corrosion and low temperatures are factors that enter into the Paducah plants. In this respect, they are similar to the K-25 installation at Oak Ridge, which Kellogg engineered through its Kellex Corporation subsidiary during World War II.

The purpose of gaseous diffusion plants is to separate the fissionable isotope, U-235, from uranium hexafluoride, the latter gas compound including both the normal uranium 238 and its "explosive" isotope.

A special weldor-training school has been set up at Paducah by Kellogg to meet the emergency completion schedule set in effect when our Korean troubles started. Weldors are put to work as soon as they pass the exacting Kellogg test requirements.

When completed, the AEC Paducah project will take up about 7,500 acres, of which about 20% will be deeded to Tennessee Valley Authority for an $88,000,000 steam power plant some five miles from the plant. This, and an equally large power plant constructed by private industry, will supply a constant power load of about one million kilowatts.

* * *

When a true genius appears in the world, you may know him by this sign, that all the dunces are in a confederacy against him.
—Jonathan Swift

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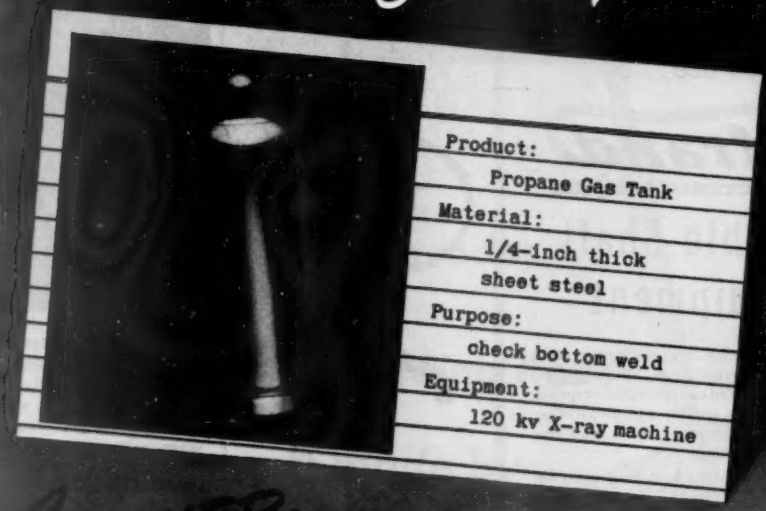
What's the right X-Ray film?



ANSWER:

KODAK INDUSTRIAL X-RAY FILM, TYPE A

With several hundred of these tanks in use, subject to frequent handling as well as high pressure, safety demanded that the bottom weld be sound—that there be no serious lack of fusion or gas porosity.

To make these radiographs, the radiographer used Kodak Industrial X-ray Film, Type A; 120 kv; .005-inch lead screens, front and back.

Type A has enough speed to keep exposures reasonably short even at low voltages. Its high contrast and fine graininess are also valuable in taking full advantage of higher kilovoltage machines in detecting irregularities in thick or dense materials.

RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price, $3.

A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. These provide the means to check welds efficiently and thus extend the use of the welding process.

Type A—has high contrast with time-saving speed for study of light alloys at low voltage and for examining heavy parts at 1,000 kv. Used direct or with lead-foil screens.

Type M—provides maximum radiographic sensitivity, under direct exposure or with lead-foil screens. It has extra-fine grain and, though speed is less than in Type A, it is adequate for light alloys at average kilovoltage and for much million-volt work.

Type F—provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type K—has medium contrast with high speed. Designed for gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of calcium tungstate screens.

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A wide selection of models and variable speeds meet requirements for shop arrangement and dependable performance when you use . . .

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Flexible Shaft Equipment

There is a Strand flexible shaft machine to meet practically every industrial need . . . floor models, bench models, overhead models, variable speeds and power. This is quality equipment that stands up under hard usage . . . the kind you select because of dependability.

Review the models shown here, then write for catalog and full information.

FLOOR MODEL—the floor-mounted flexible shaft machine is one of the most popular. It can be moved from place to place. Amply powered, the stand is out of the way while the head is light and easy to work with. Model shown is three-speed mounted on swivel yoke adjustable floor type tripod. Available in ⅓ H. P. to 1½ H. P., inclusive.

BENCH MODEL—here is convenient flexible shaft equipment that can be mounted on bench right near the work. Portable to the extent that it can be taken from place to place. For steady, fast production, consider the bench-mounted flexible shaft machine as part of your production setup. Model shown is three-speed mounted on swivel type adjustable bench column. Available in ⅓ H. P.

OVERHEAD MODEL—for production line work, overhead-mounted flexible shaft machines are a real convenience. Motor and mechanism are out of the way and flexible shaft conveniently located. To meet your requirements, review all models of STRAND flexible shaft machines. Model shown is three-speed vertical type for overhead mounting . . . it is available in ⅓ H. P. to 1½ H. P., inclusive.

A complete selection to meet every need!

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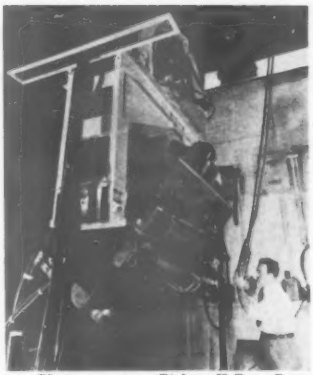

Photo courtesy Picker X-Ray Corp.

25,000,000 VOLT betatron is used to radiograph armaments ranging in thickness from 1 to 15 in. in tank armor, cannon, valves, breech ring mechanisms, crank shafts and other parts. At a distance of 4 ft the betatron can penetrate 3-in. of steel in 6 seconds, 6 in. of steel in 30 seconds and 8 in. of steel in 2 minutes. Discontinuities as small as 0.005 in. without magnification can be detected.

Billion Dollars Spent To Boost Steel Output

THE steel companies of the United States spent a total of $1,041,000,000 for new equipment and construction during 1951, according to the American Iron and Steel Institute. In 1950 they spent $513,000,000.

In 1952, the companies plan to spend even more money, about $1,300,000,000, according to AISI, on the basis of estimates. Last year the companies increased their combined annual steelmaking capacity more than 4,300,000 tons to a record high level approaching 108,600,000 tons.

* * *

7½-Mile Pipeline Carries Nickel Ore Concentrate

BULK concentrate from 3,650,000 tons of nickel-copper ore is being pumped annually through a new 7½-mile wooden pipeline constructed by The International Nickel Co. of Canada, Ltd. The concentrates go to reduction plants at Copper Cliff, Ont.

The wooden pipeline is part of International Nickel's $130,000,000 program of underground mine expansion. It is tied in an existing pipeline system that carries waste material to a disposal area.

* * *

The whole of government consists in the art of being honest.—Thomas Jefferson

Welding Exhibitors at Tool Show

A CONSIDERABLE number of welding equipment and accessory manufacturers will be in attendance at the American Society of Tool Engineers Industrial Exposition at Chicago, March 17-21. Stage for the show is the Chicago International Amphitheatre. It is expected more than 380 exhibitors will show their wares.

Visitors from the welding industry will want to stop by the booths of Ampco Metal, Inc.; *American Machinist;* American Wheelabrator & Equipment Corp.; Bausch & Lomb Optical Co.; Bay State Abrasive Products Co.; The Brush Development Co.; Chicago Pneumatic Tool Co.; Chicago Wheel & Mfg. Co.; Delta Power Tool Div.; Handy & Harman; Hanna Engineering Works; Haynes Stellite Div.; Ingersoll-Rand Co.; Magnaflux Corp.; The Metal Removal Co.; Miller Motor Co.; Norton Co.; Oakite Products, Inc.; The Osborn Mfg. Co.

* * *

Ryan Jet Parts Plant Starts Production

THE Ryan Aeronautical Co., San Diego, Calif., has placed in production about 25% of its recently completed 75,000 sq ft building for jet parts manufacture. When the rest of the machine tools get there, more area will be put to use. The additional space is expected to speed output on a backlog of 46 million dollars for airframe components and aircraft engine accessories.

Employment at the Ryan plant will be increased from 3,500 to more than 4,500 this year to handle the business in sight, according to T. Claude Ryan, president of the firm. Largest new contract for Ryan is for company-designed external fuel tanks for long-range combat operations. These tanks, the largest known to be in production, are fabricated by resistance seam welders. Another contract calls for volume production of exhaust system for the Continental 1790 engine used to power tanks and other heavy combat vehicles. Certain sections of the exhaust system will have Ryan ceramic coating to extend service life.

* * *

New Line for W. P. & R. S. Mars

THE Goodyear Tire & Rubber Co., Inc., has appointed the W. P. & R. S. Mars Co., Duluth, Minnesota, as a distributor of Goodyear industrial rubber products.

an ACCO product
for Stainless Steel WELDING
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BURNING...
stable even at lower heats
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For Longer Runs and Lower Costs

. . . resistance-weld with AMPCO WELD cold-bent tips

Ampco Weld cold-bent offset tips are made without patterns or special dies. Cold bending retains all physical properties too. Moreover, because holes bend with metal, there's no special drilling needed for water passages. That's why you get prompt service and fast delivery when you use Ampco Weld cold-bent tips.

But that's not all you get. You get longer runs and lower costs too — because the water passage gives you cooling right to the welding face. So, place your order today and enjoy all these advantages.

. . . and AMPCO Engineering Service when you need it

Behind the famous Ampco Weld line of resistance-welding products is a corps of experienced engineers, ready to help you solve your problems. Just get in touch with us.

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It's Production-Wise to Ampco-ize

RW-2

Welding Inventor Receives Pipe-Cutting Patent

I. A. WOERNER, former board member of the Denver section, American Welding Society, has received patent rights on his "tubular profile cutter." This device rapidly flame cuts a large variety of shapes, angles, mitres and bevels on pipe and tubing, says Mr. Woerner.

A pioneer in the welding industry, Mr. Woerner started his first welding business in Salina, Kansas, in 1910. Subsequently, he operated the only welding shop between Salina and Denver, Colo., during which time he designed and installed numerous storage and transport systems for fuel on Kansas farms. He worked for the Army Air Force during World War II.

Tubular construction of such equipment as hydraulic tractor loaders, terracing and agricultural equipment has occupied him since then. Building such equipment gave him the idea for his tubular profile cutter.

Mr. Woerner describes his machine as being useful for production cutting of most forms of tubing and piping in oil field and farm implement fabrication as well as in certain structural applications. The machine has been displayed at the Western Metal Show, and duplicate models are, at present, in use throughout this country, Europe and Africa.

* * *

110,000,000 Oz of Silver Used by U. S. in 1951

A GROWING demand for silver in industry is noted by *The Review of the Silver Market*, a publication issued by Handy & Harman, New York City. In spite of a very sharp dropping off in demand for sterling by silverware manufacturers, about 110,000,000 oz of silver were used in the arts and industries of this country. This is, however, a drop of 10,000,000 oz from 1950.

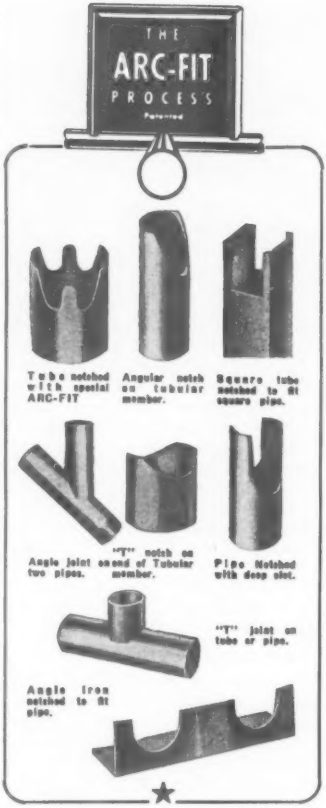
The development of low-temperature brazing alloys and silver solders by the Handy & Harman laboratories has brought about wide-scale use of silver brazing in recent years. Silver brazing has been particularly marked in industries producing large quantities of parts that must have strong, leak-tight and ductile joints.

Adequate supplies of silver should be available this year, says the *Review*, even if silver is substituted more widely for strategic metals.

* * *

. . . A woman is only a woman, but a good cigar is a smoke.—Rudyard Kipling

THE ARC-FIT PROCESS


Tube notched with special ARC-FIT
Angular notch on tubular member.
Square tube notched to fit square pipe.
Angle joint on two pipes.
"T" notch on end of Tubular member.
Pipe Notched with deep slot.
"T" joint on tube or pipe.
Angle iron notched to fit pipe.

TOPS IN SHOP EFFICIENCY

5 seconds to notch Tubing and Pipe Ends

The answer to many problems confronting large and small shop owners. No shop can afford to be without the ARC-FIT—no matter how large or how small. Manual or power operated—fits the ARC-FIT hand press or any standard power press.

ARC-FIT is a patented precision-built shearing tool which prepares the ends of tubing or pipe to produce welded or brazed tubular "T" or angle joints. ARC-FIT will not deform the tube or pipe and no further finishing is required—no sawing, cutting, or removing sections with milling cutters. Our literature gives many fine points on operation, construction, and application—send for it today —also write for quotations.

VOGEL TOOL & DIE CORPORATION
1817 N. 32ND STREET
Dept. W-E
MELROSE PARK, ILL.

Put **SAFETY** *and* **SAVINGS**
in the palm of your hand!

ORDER DIRECT
from manufacturer

PENOPTIC

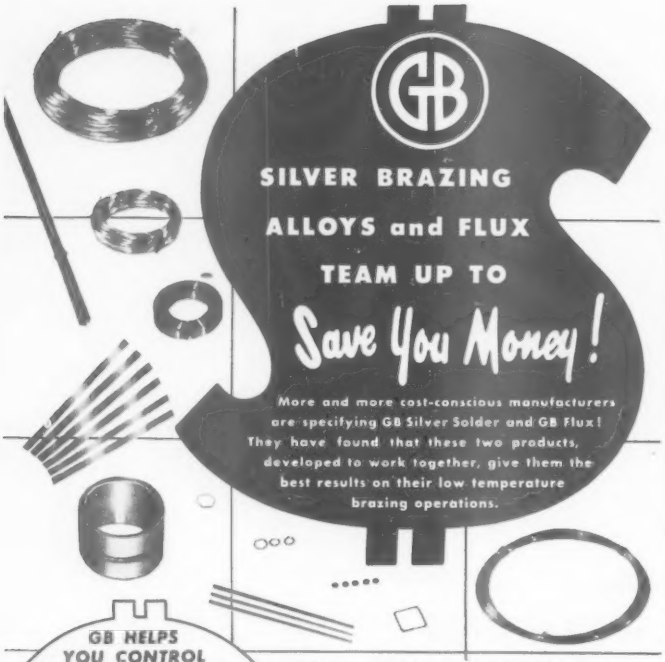
INDUSTRIAL LENSES

For more savings and quick service, order "Penoptic" quality industrial lenses *direct*. There's *always* a complete assortment of welding lenses, welding blanks, safety lenses and clip-on goggles in stock! All orders are filled and shipped immediately. No waiting. For more than a quarter of a century the Pennsylvania Optical Company has supplied industrial lenses made by men with experience and know-how in producing precision ground and polished lenses. Write, wire or phone for information on the complete line.

PENNSYLVANIA OPTICAL COMPANY
READING, PA.

Known for Fine Ophthalmic Products Since 1886

*PENOPTIC is the trade name of Pennsylvania Optical Company


SILVER BRAZING
ALLOYS and FLUX
TEAM UP TO
Save You Money!
More and more cost-conscious manufacturers are specifying GB Silver Solder and GB Flux! They have found that these two products, developed to work together, give them the best results on their low temperature brazing operations.

GB HELPS YOU CONTROL THESE COST FACTORS!

SPEED
HEATING
MATERIAL
LABOR
CLEANING
FIT-UP
PREPARATION

GB Silver Solders are available in six standard alloys—each developed to meet specific cost and production requirements. All are available in the most convenient form to meet your needs—wire coils or straight lengths, strips, sheets or formed pieces.

GB No. 50 Silver Solder, melting range 1160-1175°F
GB No. 50N Silver Solder, melting range 1240-1260°F
GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F

And, if you require a special Silver Solder, Goldsmith's Technical Service Division is ready to give you competent assistance—their recommendations will be backed by 80 years of experience in alloying and refining precious metals.

GB FLUXES

Produced under strict laboratory control, GB Fluxes are fully active, deep penetrating, stable and economical. While developed primarily for use with GB Silver Solders, they produce high quality joints with any good silver solder.

GB DATA BOOK

Here's down-to-earth information on the important phases of low temperature brazing. You can get a free copy from your GB Distributor—Write us and a copy will be forwarded to you.

GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

Western Zone NWSA Meets at San Francisco

Two days of activities were scheduled for the annual western zone meeting of the National Welding Supply Association at the Hotel St. Francis in San Francisco on Feb. 7 and 8. A special session on distributor problems was slated for Feb. 7. Scheduled speaker for the Friday afternoon session was James F. Lincoln, president, The Lincoln Electric Co., Cleveland.

In charge of the meeting was G. Milton Sims, Absco Welding Supplies, Los Angeles, western zone vice-president of NWSA. First planned discussion was by Robert E. Craig, Craig Welding Supply Co., Los Angeles, whose subject was the importance of keeping up on new welding products and developments. A round table discussion on distributor economies was led by Chairman Sims on such subjects as back order handling, catalogs, invoicing, stock arrangements, truck maintenance and office equipment.

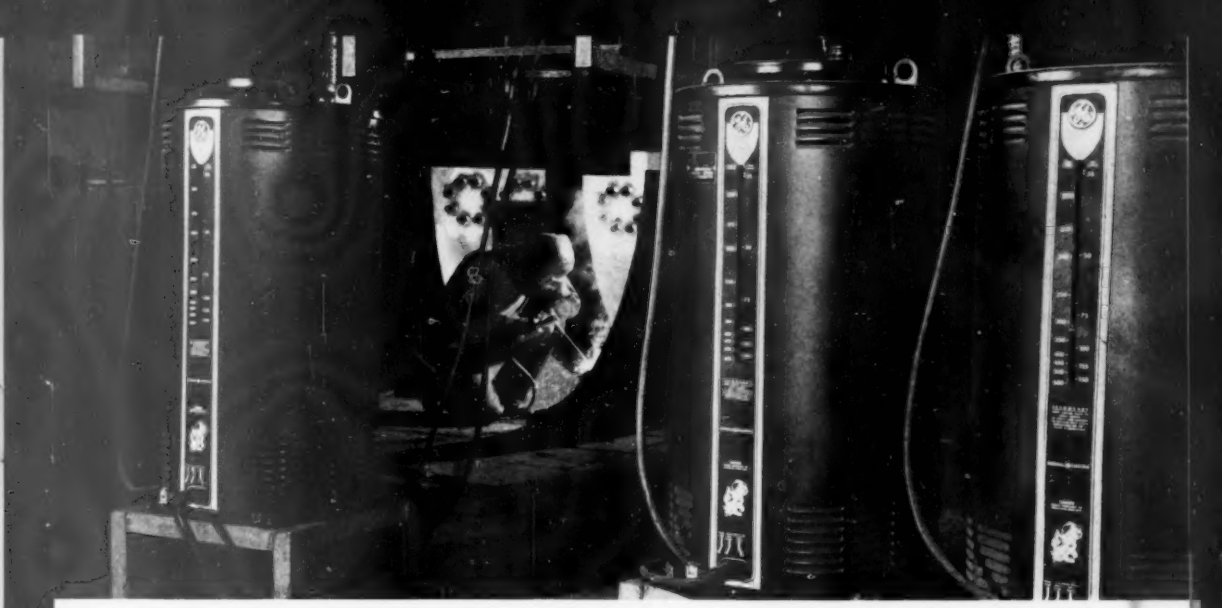
Friday's activities opened with talks by Mr. Sims and advisory secretary Thomas A. Fernley, Jr. R. S. McCracken, Jr., president of NWSA, then gave a review of association activities and advantages. Direct mail advertising was discussed by A. G. Pond of A. G. Pond Co., San Jose, Calif. How distributors can aid the general advancement of welding was the theme of a talk by Thomas B. Middleton, Middleton Welders Supply Co., San Leandro, Calif. The inadequacy of simply meeting the competition was the provocative subject of remarks by John D. Louth, McKinsey & Co., San Francisco.

The afternoon's sessions were led off by Norris J. Graham, Hickinbotham Bros., Ltd., Stockton, Calif., who advised delegates on importance of good layout and display. Elmer Bakke, Welders Supply Co., Inc., Seattle, presented an effective method of cylinder control and demurrage billing. How to select, hire and train welding salesmen was discussed by Harry Moore, Moore's Welding Supply Co., Sacramento, Calif.

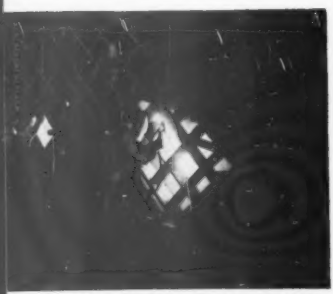
* * *

New Ampco Weld Distributor

UPTON, Bradeen and James Ltd. of Canada has been appointed exclusive distributor of "Ampco Weld" resistance welding electrodes, dies, holders, rods, bushings and wheels by Ampco Metal, Inc., Milwaukee. The main office of Upton, Bradeen and James is at Toronto; branch offices are in Moncton, N. B., Montreal, Quebec, Ottawa, Hamilton, Windsor, Winnipeg and Vancouver.



BEST FOR 3 OUT OF 4 WELDING JOBS!



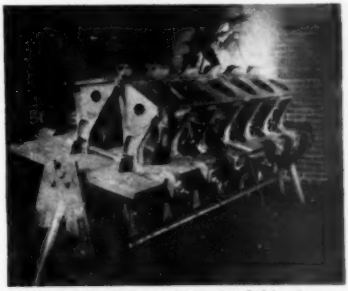
WELDING SPEEDS INCREASED 20% after this company switched to AC. Deposition rates may be doubled because AC permits the use of higher currents and larger electrodes.

AC ELIMINATES TROUBLESOME ARC BLOW, permitting these weldors to deposit ⅜ inch fillet up to 20% faster. AC is the ideal choice for deep fillet welding because the operator can easily control the arc.

G-E AC Welders Increase Speed, Improve Weld Quality, Cut Costs, Eliminate Arc Blow

See Your G-E Arc Welding Distributor for complete information on G-E AC welders. They are available in 200- to 500-amp ratings for indoor or outdoor use. Most models are available on short delivery. Your distributor also carries a complete line of DC, engine-driven, Inert-Arc and Atomic-Hydrogen welders, plus electrodes and accessories. You can find your nearest distributor's name by looking for General Electric under "Welding Equipment" in the yellow pages of your telephone directory.

AC CUT COSTS 10% and increased welding speeds 15% for this iron works. With AC, you save four ways —on labor, electrodes, power and original cost.



IMPROVED WELD QUALITY enabled this plant to meet rigid specifications on diesel engine crank cases and marine gear cases. The absence of arc blow makes it easy to deposit weld metal smoothly and uniformly, even in grooves and corners.

GENERAL ELECTRIC

Section F711-20, General Electric Company, Schenectady 5, N. Y.

Please send me immediately publications on the following G- AC welders.

× for immediate project
√ for reference

- ☐ 200-amp, GEC-553
- ☐ 300-amp, GEC-652
- ☐ 400-amp, GEC-750
- ☐ 500-amp, GEC-812
- ☐ 300-amp Indoor or Outdoor Model, GEC-779

Name .....

Company .....

Address .....

City ..... State .....

FOUR HEADED Meco TORCH...

QUADRUPLES CUTTING USES.

Four different angle heads give the MECO Super Cutmaster the amazing flexibility to handle any cutting job. This four-in-one torch is used by leading American industries for heaviest hand cutting and general service. Pre-heat flame stability assured by spring tension control valves. Easy-to-open cutting valve is adjusted by touch to provide correct amount of oxygen for the job.

Various mixer designs use either pressure or low pressure Acetylene, low pressure City Gas, Butane, Propane, or Hydrogen.

The tougher the job—the sooner you'll specify Super Cutmaster to your MECO dealer.

Meco

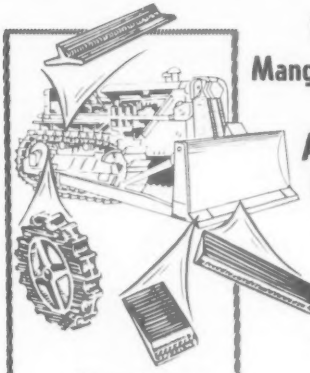
Modern Engineering CO., Inc.

3411 PINE BLVD. ST. LOUIS 3, MO.

WORN TRACTOR PARTS

Rebuilt with . . . MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945



11%—13½% Manganese-Nickel Steel

ADDS LONG LIFE TO EXPENSIVE EQUIPMENT

- For worn tractor drive sprockets, track rollers and idler wheels — USE MANGANAL BARE ELECTRODES.
- To repair edge of tractor blade — USE MANGANAL ROUND or SPECIAL SHAPE APPLICATOR BARS.
- For worn tractor corner bits — USE MANGANAL FLAT APPLICATOR BARS.

Remember!

Manganal usually outlasts new tractor parts.

FREE Complete details on the speedy and economical repairs of tractor parts. WRITE NOW! NAME OF NEAREST DISTRIBUTOR ON REQUEST. Send for catalog and price list.

STULZ-SICKLES CO. SOLE PRODUCERS 92 N. J. Railroad Ave. Newark 5, New Jersey

Thermacote Company Moves into New Building

INCREASED demand for welding products from the Thermacote Company has prompted moving of East coast facilities into a new and larger building at Newark. The new factory contains 32,000 sq ft and will permit not only increased output of such items as plastic cover lenses but will enable several new lines to be produced. Thermacote maintains offices in Chicago and Los Angeles.

* * *

Vacu-Blast Builds New Plant

THE Vacu-Blast Co., Inc., manufacturer of abrasive blast-cleaning equipment has started construction of a new plant at Belmont, Calif. The new 8,400 sq ft plant will provide more space for present production items and allow introduction of new products. These will include a new portable open sandblasting machine and a unique "jet-blast" nozzle. The new nozzles are anticipated to increase blast cleaning efficiency by 50%, say Vacu-Blast officials.

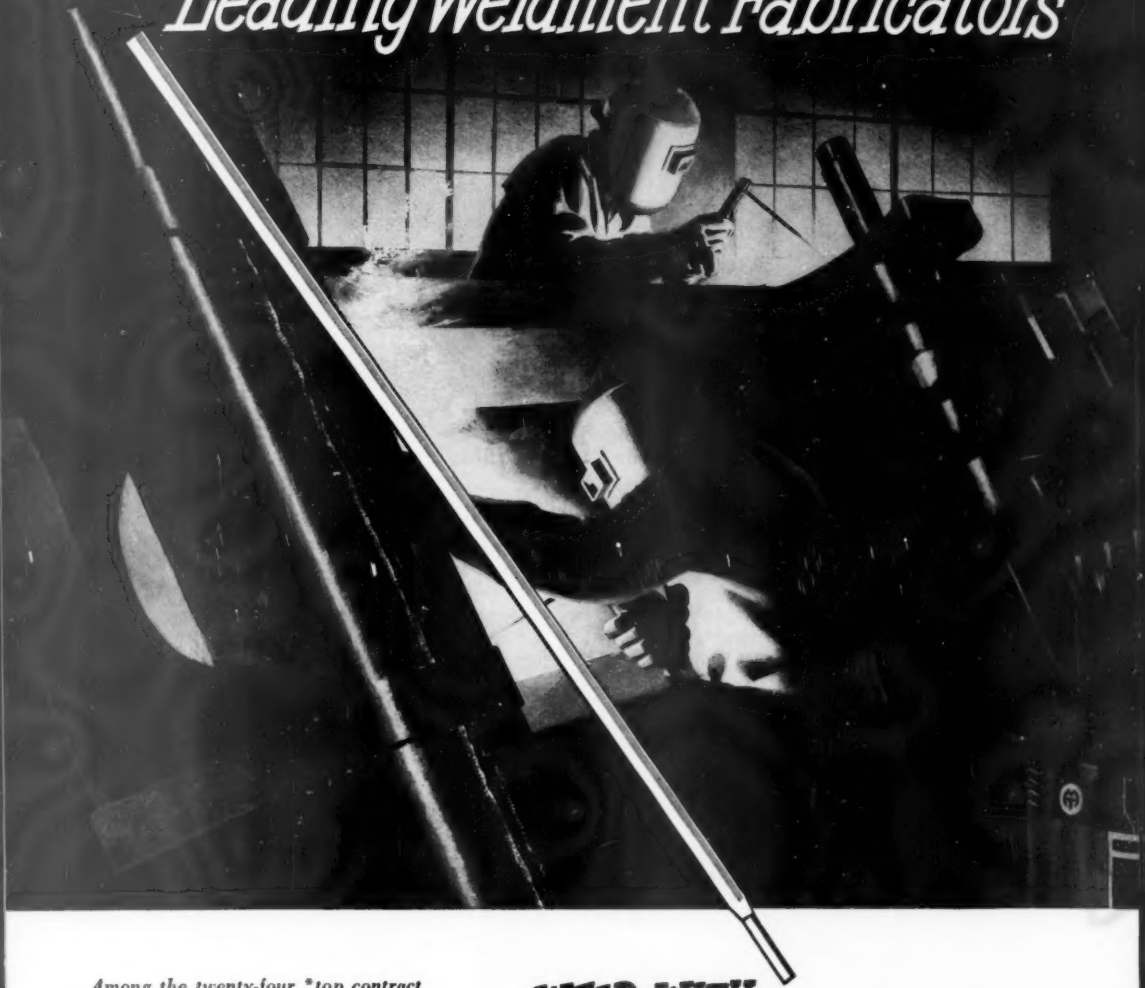
Machining and sheet metal work will be handled in the new plant says Sidney B. Fox, vice-president. Head offices will remain at 350 Peninsular Ave., San Mateo, Calif.

* * *

Mallory Spends $500,000 for Bigger Plant

ADDITIONAL manufacturing facilities for the capacitor and metals and ceramics divisions of P. R. Mallory & Co., Inc., Indianapolis, are scheduled to cost $500,000. Some 35,000 sq ft of space will be added for the manufacture of electrolytic capacitors. The metals and ceramics division, formerly the special metals division, is being expanded as rapidly as key administrative and technical positions can be filled. An extra 27,000 sq ft of space will be allotted to this activity.

15 out of 24 Leading Weldment Fabricators



*Among the twenty-four *top contract welding firms, fifteen regularly weld with Murex Electrodes.*

More of the leaders in important industries prefer Murex Electrodes in their welding operations because they can be sure of sound welding—high deposition rates for economy and speed of production.

*Those having AAAA directory ratings.

WELD WITH...

MUREX®

METAL & THERMIT CORPORATION 100 EAST 42nd ST., NEW YORK 17, N. Y.

ELECTRODES • ARC WELDERS • ACCESSORIES

Fuse-Well

CAST IRON RODS and ELECTRODES

The Name To Specify When You Buy!

SOLD THRU LEADING DISTRIBUTORS

- SQUARE "Fuse-Well" No. 11 (Cast Iron Gas Welding Rod)
- SQUARE "Fuse-Well" No. 14 (Moly Hi-Strength Rod)
- SQUARE "Fuse-Well" No. 16 (Hard-Surfacing Rod)
- ROUND "Fuse-Well" No. 19 (Hard-Surfacing Electrode)
- ROUND "Fuse-Well" No. 22 (Machineable Coated Electrode)

"Flux-Well" WELDING FLUXES

"Fuse-Well" CAST ALUMINUM WELDING RODS

THE CHICAGO HARDWARE FOUNDRY CO.

"DEPENDABLE SINCE 1897"

2500 N. COMMONWEALTH AVE., NORTH CHICAGO, ILL.

L-M

THIS WIRE FORMED AND FLATTENED INTO THIS WASHER WITHOUT WASTE

COINED WIRE WASHERS Cut Unit Costs by Eliminating Waste in SILVER BRAZING

NO DIE CHARGES

You save up to 50% because the high cost of scrap in blanking out of sheets is entirely eliminated. Available in EASY-FLO and SIL-FOS.

Send specifications for free samples.

LUCAS-MILHAUPT ENGINEERING COMPANY

5057 S. Lake Drive · Cudahy, Wisconsin

Metal-Processing Dept. Added by Pennsalt

SALES and service in chemical specialties for metal cleaning, fabricating and processing have been consolidated in one metal-processing department by The Pennsylvania Salt Mfg. Co., Philadelphia. The department headed by J. J. Duffy, Jr., sales manager, represents a merger of two groups which have heretofore functioned independently of one another within the company; namely, the industrial metal cleaners department and the Fos products department.

Pennsalt makes more than 30 alkaline cleaners, inhibited acid cleaners and emulsion cleaners. The Fos products groups includes a number of Fos Process installations throughout the steel industry. The Fos Process consists of compatible cleaning, pickling, phosphatizing and lubrication in the extruded steel, tube drawing, wire drawing and ordnance industries.

* * *

Neoprene Shows Promise as Pipeline Coating

A NEW Neoprene material made by E. I. du Pont de Nemours & Co., Inc., is now being produced for protective coatings on the exterior of tanks, process equipment, structural steel, pipelines and similar uses. The new material is intended for resistance to splash, spill and corrosive fumes and atmospheres.

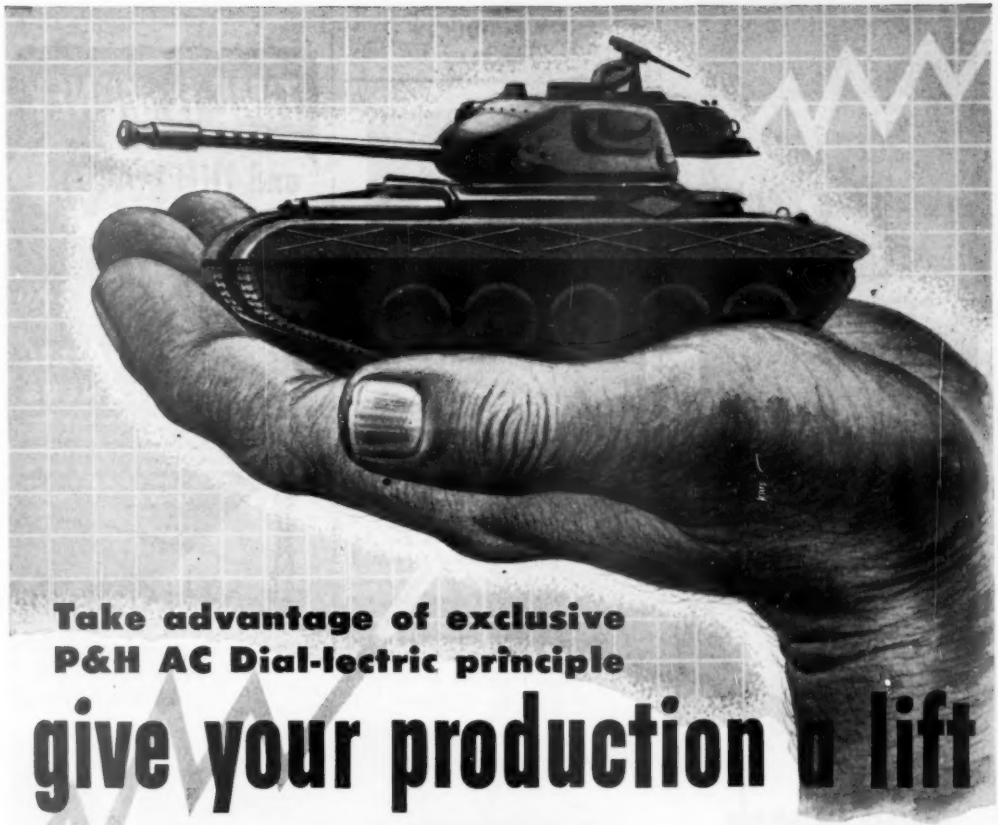
Brushed on, it gives a thick film that has high resistance to acids, alkalis, oils, most hydrocarbons and sunlight and weather. The coating cures ready for service at room temperature in 24 to 48 hours by the addition of an accelerator at the time of use.

A disadvantage of the new material is its "two-part" application; the user must stir a few ounces of accelerator into each gallon of material just before application. After adding the accelerator, the material in the can hardens within 36 hours. Before adding the accelerator, the material can be stored in cans for a year or more. To be sure of good adhesion, surfaces must be thoroughly wire-brushed or sandblasted and a coat of chlorinated rubber primer applied.

* * *

Jim Banash Moves to California

JAMES I. Banash, well known consulting engineer in the acetylene and safety fields, has moved from 230 No. Michigan Avenue, Chicago to 11901 Sunset Blvd., West Los Angeles 49, Calif.



Take advantage of exclusive P&H AC Dial-lectric principle

give your production a lift

— with safe, open-circuit voltage . . . easy, quick-start arc . . . time-saving, built-in remote control . . . compact AC design

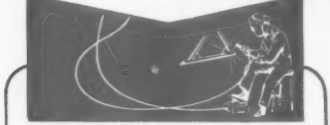
Armor plate welding calls for low-hydrogen or stainless steel electrodes. P&H, pioneer in the low-hydrogen field, also offers the AC welder that gives you the best weldability with these rods — for greater production.

Your men like the P&H AC Dial-lectric — like its safety under the most adverse conditions; like the easy, quick-start arc, the elimination of arc-blow. And they get more done! Get sounder, better looking welds in less time, thanks to built-in remote control which lets them select the right heat at the work, turns *walking time* into *welding time.*

Because these welders give production such a lift, P&H has stepped up its delivery schedules to meet defense demands without delay. Get your production rolling in high gear. Order your P&H AC Welders today. Capacities up to 650 amps. Take advantage of this delivery situation while it lasts.

P&H **WELDING DIVISION**
4513 W. National • Milwaukee 14, Wis.
HARNISCHFEGER CORPORATION

Vary the welding heat at the Work instead of the welder!



Mullenbach

ARCTROL

Provides *portable* voltage control at the work; selects the exact welding heat for every job *without walking back to the welder!* Retains full welder heat range; saves hours; makes better, more uniform welds. *Handiest aid any welder ever had*—for precision welding, for production jobs!

Available for most makes of D.C. arc welding machines. Write for descriptive ARCTROL circular, giving make and model number of your welder!

Mullenbach

Electrical Manufacturing Co.

2300 East 27th Street, Los Angeles 58, California

NEW PRODUCTS

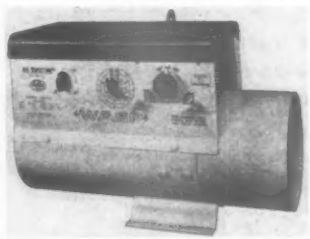
(Continued from page 46)

Bank Drying Ovens

To meet the needs of high or low production schedules with low-hydrogen electrodes, Blueweld "Lo-Hydrogen" stabilizing ovens can be stacked in banks. Picture above shows the electrode drying ovens stacked three high to provide a stabilized storage space for 400 to 5,000 lb of electrodes. The Model 400 SE stabilizing oven has self-locking stacking attachments and can be individually controlled even in banks. Moisture content of the electrode coatings stays at optimum level at all times.

FRED C. ARCHER, INC., 606 West Wisconsin Ave., Milwaukee 3, Wis.

* * *



D-C Arc Welders

SPECIAL volt-ampere characteristics of two new Model GA "Wasp" d-c arc welders are claimed to suit them for straight-polarity inert-arc welding with thoriated-tungsten electrodes. Range of welding current for the 150-amp machine is 20 to 185 amp, for the 200-amp model 30 to 250 amp.

Both welders are said to have excellent commutation at all settings, plus the advantages of self-excitation and split-pole cross-field design.

These lightweight models are compact and can be moved about easily on a two-wheeled carriage.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

TIME is MONEY

and THERMACOTE PRODUCTS SAVE BOTH

THERMO Spiral TIP CLEANERS

are guaranteed unbreakable. They do a cleaner, smoother job because the new spiral design prevents carbon and slag from jamming in the orifice and eliminates breaking of the cleaner when cleaning tip.

TRIPLE DUTY COVER LENS

are guaranteed to outlast any lens at any price. They provide clearer vision, eliminate eye strain.

KORNER KLAMP

PAY FOR THEMSELVES EVERY TIME USED

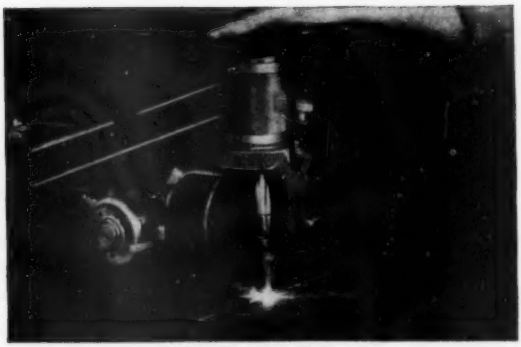
because a perfect 90° angle is assured every time when welding 2 pieces and spoilage is eliminated.

THERMACOTE CO.

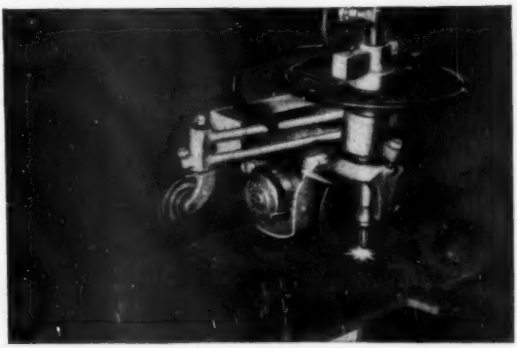
NEWARK CHICAGO LOS ANGELES

PARTS UNLIMITED

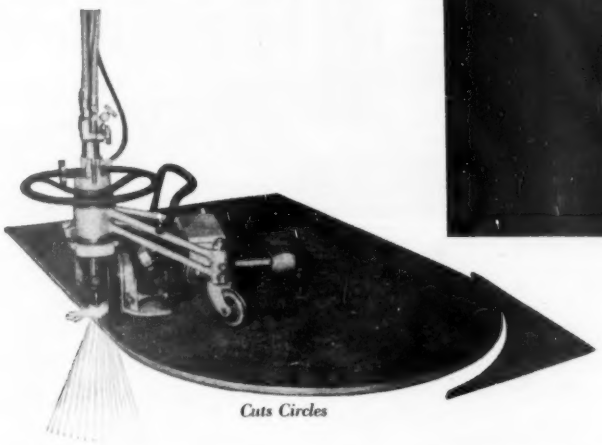
... *in Jig Time*



Cuts Irregular Shapes



Cuts Straight Lines



Cuts Circles

In large and small shops alike, the OXWELD CM-16 Portable Cutting Machine fills an unbelievably wide variety of oxygen cutting requirements. It cuts circles automatically. Hand-guided, it cuts irregular shapes. Operated on track, it cuts straight lines.

Indoors or out—wherever steel needs shaping—the CM-16 makes it easy to "tailor" parts as fast as the work can be laid out. *And its ready adaptability for special jobs is limited only by its operator's ingenuity!*

The CM-16 sets up as quickly as any manual outfit. It weighs only 45 lb., travels directly on the work, and is easy to carry from job to job. In normal use, it cuts up to 4 in. of steel; with standard accessories, it cuts materials up to 18 in. thick and it cuts bevels.

Any LINDE representative will be glad to show you how the OXWELD CM-16 Portable Cutting Machine can boost production and cut fabricating costs in your shop. Write for catalog, Form 4487, or call the LINDE Office nearest you today for a free demonstration.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Oxweld Trade-Mark **CM-16 PORTABLE CUTTING MACHINE**

60 more workers

WYPO

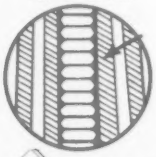
Wipes and POlishes

CUTTING and WELDING

TIP CLEANERS

STANDARD SET OF 12
Cleans 27 Drill Sizes.
Nos. 75 to 49 Incl.

JUMBO SET OF 9
Cleans 19 Drill Sizes.
Nos. 48 to 30 Incl.



U.S. Patent No. 2,429,581
In Canada 1948

The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner. Straight sided valleys, another outstanding feature of Wypo Tip Cleaners, insures a thorough cleaning and removal of all waste.

DOUBLE THE LIFE OF YOUR WELDING AND CUTTING TIPS

Fast, easy cleaning without jamming, scratching or enlarging the tip port means added years of service to your welding and cutting tips. Only with Wypo Tip Cleaners do you get thorough cleaning and polishing with one quick and easy motion. Wypo Tip Cleaners are specified for all types of welding cleaning jobs by the U. S. Navy, leading railroads, oil companies, steel mills, ship yards and industrial plants. Packed in a handy metal container.

Recommended and sold by the world's largest manufacturers of welding equipment

MAITLEN AND BENSON INC
1395 Obispo St., Long Beach 4, Calif.

Buy Wypo Tip Cleaners at your welding supply dealers today.

SAVE TIME and MONEY

NEW EASE AND SPEED

ON PIPE AND
STRUCTURAL STEEL
LAYOUT JOBS

WITH THE

CONTOUR MARKER

Efficient, accurate, easy to use. Any of the angles illustrated can be marked off in 5 minutes or less with assured accuracy. Both models complete with adapter for square or rectangular shapes.

STANDARD MODEL	JUMBO MODEL
Fits into hip pocket. For use on pipe 1½ to 18 inches.	For 16 to 48 inch pipe. Includes belt to fasten on pipe.

IF YOUR LOCAL DISTRIBUTOR CANNOT SUPPLY YOU CAN ORDER DIRECT.

To: Contour Marker Corp. 1843 E. Compton Blvd. Compton, Calif.
Please send me full details on the Contour Marker.

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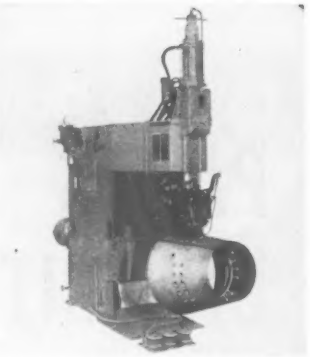


New Seam-Welding Head

CONE assemblies for jet aircraft engines are now being produced on a new welder with a special planetary seam-welding head. The head produces a continuous circular seam weld around individual coupling connections located at regular intervals around the cone.

As each coupling is welded, the assembly is progressively shifted over a clamping die to bring the next coupling between the electrodes. One man controls the operation with a foot pedal.

TAYLOR-WINFIELD CORP., Warren, O.

* * *

Plastic Safety Lenses

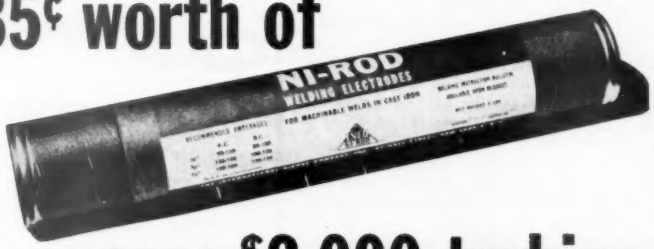
NEW AO plastic safety lenses have only half the weight of their glass counterparts and are extraordinarily resistant to breakage.

Tests shows the lenses to be highly resistant to welding spatter, splashing chemical, emery wheel sparks and small high-velocity particles. They do not fog as readily either, says the company.

The specially scratch-resistant lenses are claimed to survive the impact of a 9 oz. steel ball falling 4 ft.

AMERICAN OPTICAL CO., Southbridge, Mass.

35¢ worth of



saves $2,000 turbine rotor!

The cost of a foot-long, 1/32 in.-deep groove came close to being $2,000 and six months of lost time.

That was the spot an eastern manufacturer was in. A faulty machining cut had ruined a high-precision cast iron rotor blade needed for a marine gas-turbine air compressor.

Luckily, with the help of NI-ROD®, the shop welder was able to save the day . . . and the investment! Using only four NI-ROD electrodes, he filled the mismachined groove without difficulty. Thanks to NI-ROD's easy-handling characteristics, no pre-heating was necessary.

After welding, the rotor was finished by turning and profiling, to a ±.001 in. tolerance.

The story is typical of hundreds where NI-ROD has been used to salvage defective and damaged castings, repair worn machine parts, and correct machining errors . . . saving money and precious time.

NI-ROD, like other INCO welding electrodes and Nickel Alloys, is on extended delivery. Therefore, anticipate your needs . . . order well in advance. And remember, if you have a special cast iron welding problem, our Technical Service Department will be glad to help you. Just write, giving full details.

EMBLEM OF SERVICE INCO NI-ROD TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

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STRUCTURAL STEEL ERECTORS, FOUNDRIES, DEFENSE PLANTS, PRESSURE VESSEL FABRICATORS, SHIPYARDS, AND GENERAL FABRICATING SHOPS ARE NOW SAVING THOUSANDS OF MAN HOURS WITH THIS

NEW GOUGING PROCESS

? HAVE YOU SEEN IT ?

It's ECONOMICAL TO OPERATE

Uses only compressed air and electrodes. EASY to USE—*Any weldor can learn in a few minutes and become proficient in a few days.* AIR COOLED *for comfort of operator.* VERSATILE—*Can be used wherever you can get a weldor and the same man prepares the joint that welds it.* CUTS CLEAN—*No further preparation necessary for welding.*

ONLY $87.50 COMPLETE

Write for further information

Arcair CO.

2614 BURWELL STREET

BREMERTON, WASHINGTON

Hot Air Exhauster

INTERMITTENT or emergency removal of large volumes of air quickly and economically is provided by a new device called a Lamb "Air-Mover." Possible uses are in welding shops or processing plants where it is necessary to remove contaminants or to introduce fresh air for safe ventilation or rapid cooling.

Horn-shaped with a bell-formed base, the "Air-Mover" converts pressure of the plant line air supply or steam supply into a large induced volume of moving air. As the steam or compressed air is fed through a side inlet at the bell end, it expands at high velocity. When discharged through the outlet, it draws with it a large volume of the atmosphere to be removed.

The No. 3 Model weighing 6½ lb will move 800 cu ft of air per minute with a 90-psi pressure supply, the No. 6 Model handles 3,150 cu ft per minute at 70-psi line pressure and the No. 10 model handles 5,160 cu ft at 80-psi line pressure.

MINE SAFETY APPLIANCES Co., Braddock, Thomas & Meade St., Pittsburgh 8.

NEW PRODUCTS BRIEFS

Reinforcement of concrete floor surfaces is provided by "Floor-Plate," an 11¾ in. square plate of 0.068-in. hot-rolled steel. Plates contain 100 small rectangular holes and 100 barbed prongs ¾ in. long which anchor into the concrete. Plates are pressed into a concrete topping mix when they are installed. Acme Steel Co., 2840 Archer Ave., Chicago 8.

* * *

Heavy-duty load conveyor called "Load-Veyor" is 20-in. wide and comes in 5 and 10 ft sections with 45 and 90-deg curves. Comes with welded-on connectors that are interconnectable with the majority of other wheel conveyors of the same size. Market Forge Co., Materials Handling Div., Everett 49, Mass.

KENT

SUCTION CLEANER for Flux Recovery

PAYS FOR ITSELF saving valuable flux

Portable-type for location welding. Unused flux and small fused particles from the weld are picked up and screened . . . dust is removed . . . and the clean flux is deposited in a separate tank to be used as required!

DEPENDABILITY is built into every KENT product, and 38 years of experience in the vacuum field stands behind it. The KENT SUCTION CLEANER FOR FLUX RECOVERY is engineered for service . . . and built to last!

Full Information Available upon Request!

KENT also makes the finest in Commercial Vacuum Cleaners, Furnace Cleaners, Floor Machines, Dry Scrubbing Machines.

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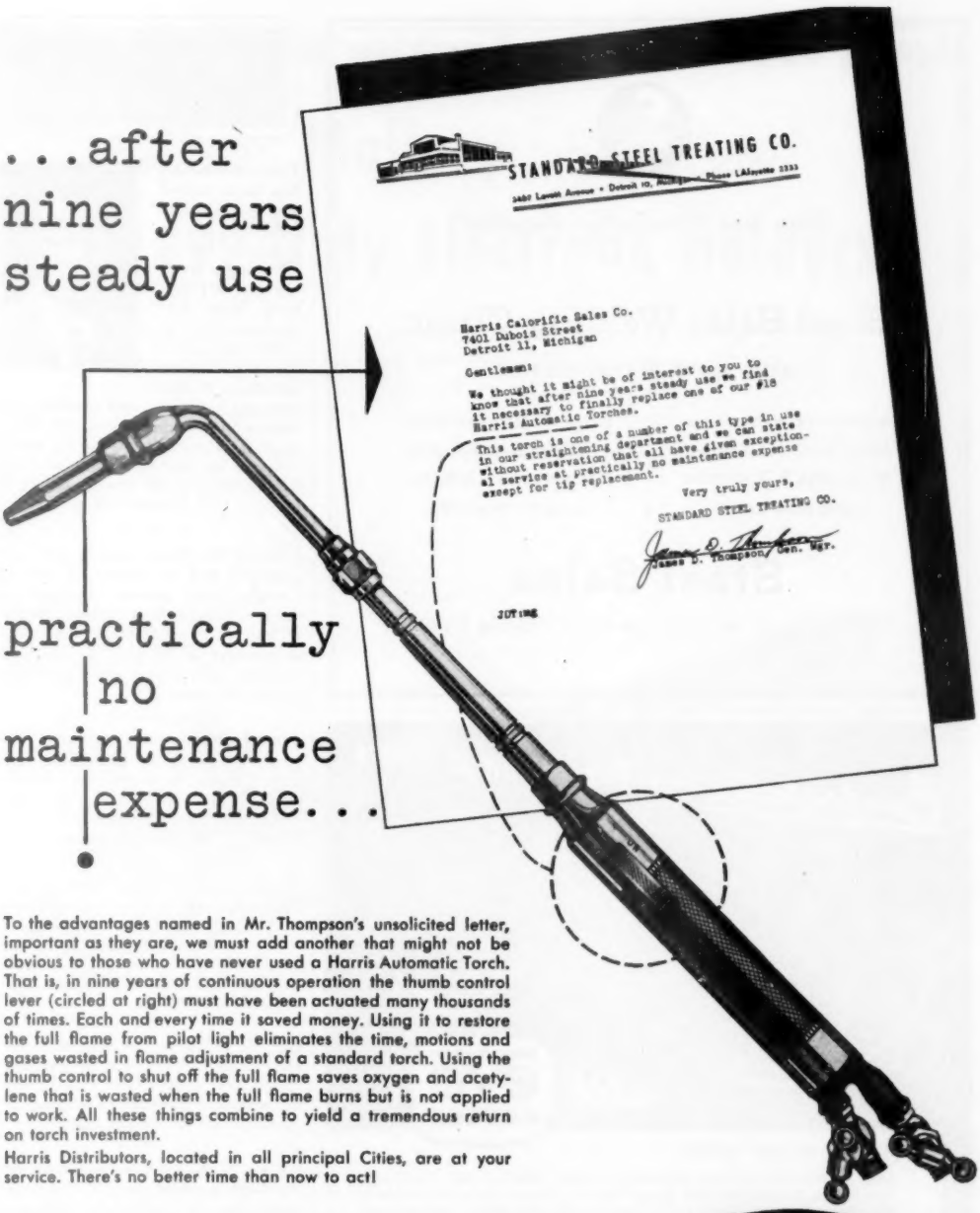
436 Canal St., Rome, N.Y.

...after nine years steady use


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #1a Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:MG

practically no maintenance expense...

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

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You are Cordially Invited

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There's no need to sacrifice comfort for safety. Get *both* with Tuc-Away Eye-Savers. It's the ideal flash goggle for under-helmet use and other glare and impact hazards! Light weight plastic frame and welded "telescoping" temples assure light, comfortable fit. 3 plastic change-around lenses are available to give *sure* protection from all types of eye hazards. Order from your welding (or safety) supplier or write direct.

FREE! *Send for magazine article giving impartial advice on best uses of plastic eye protection. Eye-Savers catalog also included.*

WATCHEMOKET OPTICAL CO., INC. DEPT. 5, PROVIDENCE, R. I.

Producers and Originators of Practical Plastic Eye Protection

About People

THOMAS SPROULE has been named manager of manufacturing of the General Electric Company's Welding Dept. at Fitchburg, Mass. Mr. Sproule, previously assistant manager of manufacturing of the company's turbine and welding divisions in Fitchburg, succeeds WILLIAM G. ARNOLD, who will be works manager of the G-E plant at New Kensington, Pa. Mr. Sproule is a 1935 graduate of Lafayette College, Easton, Pa.

* * *

EVERETT M. HICKS was elected vice president and a director of Norton Company and remains manager of the grinding machine division. FRANK W. SMITH retired from the board and as manager of the grinding machine division, but remains a vice president and a consultant.

* * *

JOHN LUND has been appointed district manager of Air Reduction Magnolia Co., in Shreveport, La., a division of Air Reduction Co., Inc. Mr. Lund assumes the responsibilities of HEBER T. WADLEY, deceased.

* * *

W. E. BRAINARD has been elected president and director of Arcrods Corp., replacing J. H. HUMBERSTONE who has become chairman of the board. Mr. Brainard joined Arcrods in 1939. C. A. WAGNER has been appointed comptroller.

* * *

BEN R. HECKER was appointed the Detroit field engineer for Ampco Metal, Inc. Since 1949 Mr. Hecker has served as a resistance welding engineer in the Milwaukee office.

* * *

HENRY A. MULLEN, manager of the resistance welding division of Ampco Metal, Inc., Milwaukee, has been appointed a member of the advisory committee of the resistance welder electrode manufacturers industry, working in conjunction with the NPA.

* * *

GORDON R. BALL, vice president, general manager and a director of the Bank of Montreal, has been elected a director of International Nickel.

To operate at spot welding forces up to 6000 pounds

New Mallory "*Premium*"

8° Heavy Duty Electrode Holders

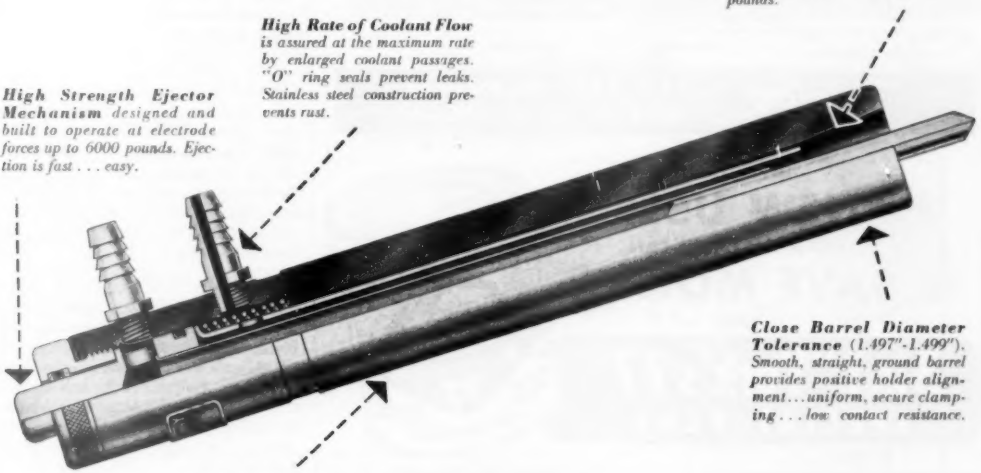
Latest addition to the widely-used Mallory line of leak-proof electrode holders, the new "Premium" heavy duty holders are designed to help you handle the higher electrode forces and welding currents required to meet the rigid specifications on military components.

Consider the special "Premium" features which help you get economical, dependable welding performance . . .

Easy Electrode Removal *is made possible—without lubrication—by the 8° taper of the electrode socket (4° per side) even at seating forces up to 6000 pounds.*

High Rate of Coolant Flow *is assured at the maximum rate by enlarged coolant passages. "O" ring seals prevent leaks. Stainless steel construction prevents rust.*

High Strength Ejector Mechanism *designed and built to operate at electrode forces up to 6000 pounds. Ejection is fast . . . easy.*



Close Barrel Diameter Tolerance *(1.497"-1.499"). Smooth, straight, ground barrel provides positive holder alignment . . . uniform, secure clamping . . . low contact resistance.*

Nickel Plated Barrel *protects against abrasion and corrosion with a pure, high quality nickel plating.*

Standard Mallory Fluted* Electrodes with 8° taper (4° per side) are available in a variety of sizes, shapes and alloys for use with "Premium" holders.

*Patent Pending

In Canada, made and sold by Johnson Matthey and Mallory, Ltd.
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Electromechanical Products—Resistors • Switches • TV Tuners • Vibrators
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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

Tippy Says:

IF NAPOLEON HAD AT WATERLOO, A WELDED TANK... HE'D NOT OF BEEN SO BLUE!

Sure Napoleon was day dreaming about that terrific welded Man-O-War... but it was wishful thinking. Are you day dreaming ... wishing for that welding electrode that will give longer life, less redressing, less mushrooming, greater current density, extraordinary service under heavy production stresses ... the electrode that will cut production costs? Here is the answer ... TIPALOY Resistance Welding Electrodes! And best of all ... TIPALOY electrodes cost no more than ordinary electrodes!

Tippy Says: ... Take a tip, try TIPALOY!

Write today for test samples and "the story of STRAIGHT LINE conductivity!"

Tipaloy INC. 1435 EAST MILWAUKEE DETROIT 11, MICHIGAN

No.10 of a Series — Branches in All Principal Cities

IMPORTANT

NEW USES MEAN THAT YOU CAN SAVE MONEY WITH

3 in 1 "York's 77" SPECIAL FLUX

FOR...

GENERAL BRAZING

CAST IRON WELDING

CAST IRON BRAZING

NO NEED TO STOCK 3 DIFFERENT FLUXES WHICH DETERIORATE WHEN ONE CAN OF

"York's 77" 3 in 1 FLUX MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77". You will save money, save labor, and save time.

1 Fear of overheating can be forgotten.

2 Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.

3 Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.

4 Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY

3349 OGDEN AVE. • CHICAGO 23, ILL.

J. R. BAREFOOT, JR., manager of operations for Federal Machine and Welder Co., Warren, O., has been elected president of The Resistance Welders Manufacturers Association for 1952. He was graduated from Penn State College and has been employed with Federal since May, 1941. He was appointed to his present post at Federal in 1949. He was previously vice-president of RWMA.

• • •

L. R. PALMER has been placed in charge of the Cincinnati office of Scott-Tarbell, Inc., welding distributors whose home office is in Cleveland. The Cincinnati office is at 626 Broadway and will carry complete service in hard-facing rods, positioners, automatic welding equipment and other accessories.

• • •

HOWARD D. TURNER has been appointed superintendent of Lukenweld division of Lukens Steel Company, Coatesville, Pa. He replaces E. RAYMOND MCCLUNG, resigned. Mr. Turner came to Lukens as supervisor of Lukenweld inspection in 1949 from a position as engineer with the Ocean Accident and Guaranty Corp.

• • •

CHARLES H. JENNINGS, president of the American Welding Society and manager of the arc welding engineering department of Westinghouse Electric Corp., Buffalo, N. Y. will address three western AWS sections in March. He will discuss "Planning for Welding" at Los Angeles on March 20, at San Francisco on March 24 and at Seattle on March 27. He joined Westinghouse in 1928 and is the author of numerous articles and two books on welding.

• • •

ANDREW B. STEVENS has been promoted to assistant factory manager at American Wheelabrator & Equipment Corp., Mishawaka, Ind.

• • •

DR. NEWMAN W. THIBAULT was named chief of the physical research section of the Norton Company's research and development department. RICHARD E. ENGLUND became grinding service engineer in charge of a new grinding service section. ROBERT W. CORNISH was appointed supervisor of training in personnel. He was formerly supervisor of sales training.

THOMAS TURNER was named vice president in charge of the Buffalo motor and control division of Westinghouse Elec. Corp. after serving as vice president in charge of industrial relations. T. I. PHILLIPS, who recently headed the East Pittsburgh division, succeeds Mr. Turner as staff vice president in charge of manufacturing. ROBERT D. BLASIER and JOHN E. PAYEN were elected Westinghouse vice presidents by the board of directors. L. R. BOTSAI resumes responsibility of manager of the Pittsburgh gearing division. G. H. MCBRIDGE is now sales manager of the gearing division.

* * *

T. F. FLEMING was appointed general manager of the Morrison Engineering Corp. to head the metallurgical department. He was formerly with the National Screw & Mfg. Co.

* * *

C. D. KING was appointed assistant vice president and chairman of engineering committees of United States Steel Co. He has been with U. S. Steel in various capacities since 1914.

* * *

ROBERT A. WEISSE has been appointed assistant sales manager by The Kaydon Engineering Corp., Muskegon, Mich. He was formerly a sales engineer.

* * *

JOHN W. SCHREIBER retired as chief construction engineer for Aluminum Company of America after 42 years of service. L. B. KUHNS succeeds Mr. Schreiber, advancing from position of general superintendent of construction.

* * *

C. H. WILLIAMS was appointed assistant executive vice president in engineering and raw materials by United States Steel Co. He was previously chief engineer in the manufacturing division.

* * *

EDWARD R. ANDERSON has been appointed president of the American Forge division of American Brake Shoe Co. He was formerly vice president of the Brake Shoe and Castings and Kellogg divisions. In his new position, he succeeds WILLIAM E. CROCOMBE, who has been made assistant to the chairman.

* * *

HERMAN H. MILLER retired after serving 50 years with Worthington Pump & Machinery Corp. as a pioneer in the compressor field.

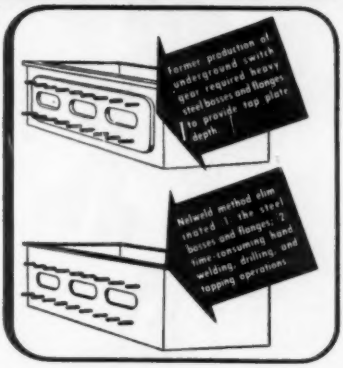
NELWELD CASE HISTORY IN POWER DISTRIBUTION EQUIPMENT

Split-second end-welding of Nelson studs on switch gear boxes, using a production jig for high-speed positioning and alignment.

A BETTER PRODUCT

Plus

- a saving in steel
- reduction in weight
- lower cost fastening


Former production of underground switch gear required heavy steel bosses and flanges to provide top plate depth.
Nelweld method eliminated 1 the steel bosses and flanges; 2 time-consuming hand welding, drilling, and tapping operations.

Production of underground switch gear housings at G & W Electric Specialty Company, Chicago, formerly involved the hand welding of heavy steel bosses and flanges to provide tap depth for the installation of cover plate studs. Now, improved design and substantial production cost-savings have been obtained through use of the Nelweld method of fastening, by which studs are simply end-welded to the face plates of the housings.

Product weight and metal costs have been reduced through the elimination of bosses and flanges. Material handling has been simplified. Slow drilling and tapping operations have been replaced by the split-second welding of Nelson granular flux-filled studs, providing a big reduction in production time and costs.

If you are now using outmoded methods of fastening to steel, find out how Nelwelding can help speed production, reduce material handling, improve product quality and lower your costs.

Full information and Nelweld Engineering Service are readily available. Simply contact your nearest Nelson representative or write Dept. W-2, Lorain, Ohio.

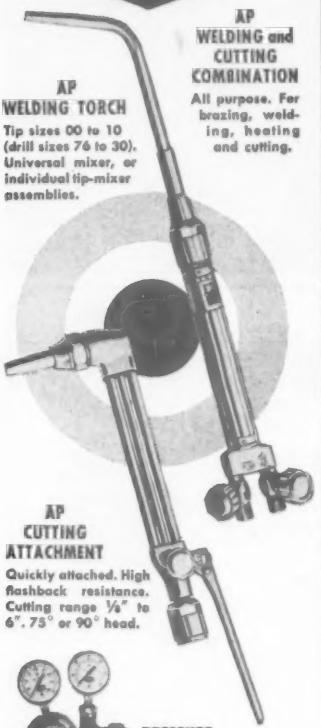
Fasten it Better...at Less Cost, with NELWELD

NELSON STUD WELDING

DIVISION OF GREGORY INDUSTRIES, INC., LORAIN, OHIO

K-G

WELDING & CUTTING EQUIPMENT



AP WELDING TORCH
Tip sizes 00 to 10 (drill sizes 76 to 30). Universal mixer, or individual tip-mixer assemblies.

AP WELDING and CUTTING COMBINATION
All purpose. For brazing, welding, heating and cutting.

AP CUTTING ATTACHMENT
Quickly attached. High flashback resistance. Cutting range ⅛" to 6". 75° or 90° head.

PRESSURE REGULATORS
Two-stage (shown) or single-stage. Dependable, safe, sensitive—stable flow. Large capacity, rugged construction.

M38 CUTTING TORCHES
Famous for ruggedness, efficiency, flashback resistance. Excellent needle valves. 75°, 90° or 180° head—top, bottom or latch lever.

Also Complete Outfits, Cutting Machines and Accessories

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The K-G Equipment Company (Inc.)
Dept. A, 30 Broadway, New York 4, N. Y.

DR. DONALD J. MCPHERSON and HAROLD D. KESSLER, research metallurgists in the metals department at Armour Research Foundation of Illinois Institute of Technology, have been promoted to supervisors. McPherson will head the newly formed physical metallurgy section, and Kessler will be supervisor of the nonferrous metallurgy section.

* * *

DR. GEORGE O. CURME, JR. has been elected a director of Union Carbide and Carbon Corp. to succeed the late James A. Rafferty, vice president and director. Dr. Curme, as vice president, is in charge of all research activities of the corp.

* * *

WILLIAM P. DRAKE, vice president of the Pennsylvania Salt Mfg. Co., Philadelphia, has been named director of the rubber, chemicals and drugs division of OPS.

* * *

JAMES P. GROWDON was named an engineering consultant on hydraulic and related engineering problems for Aluminum Co. of America. B. J. FLETCHER, assistant chief hydraulic engineer, will succeed Mr. Growdon as chief hydraulic engineer.

* * *

HENRY N. SHOIKET is the new head of the mechanical engineering department of Sam Tour & Co., Inc. He was previously an engineer with Boeing Airplane Co.

* * *

RALPH J. CAROTHERS has been named chief inspector at the Beaver Falls plant of the tubular products division of the Babcock & Wilcox Co. He succeeds the late James A. DeBee.

Died . . .

HENRY BOOTH, 60, vice-president and director of Shawinigan Products Corp., died on February 4. He had been with Shawinigan for 31 years. He became vice-president in 1940 having been previously sales manager. Very active in the affairs of the International Acetylene Association, he had been vice-president and treasurer in 1939 and 1940, president, 1941-42, director, 1943-51 and chairman of the executive committee, 1946-1952. He is survived by his widow, a son and a daughter.

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"You ain't seen nothin'"

'til you've seen the new

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ELECTRODE HOLDER

You can stop looking for a better Electrode Holder! The new Cam-Lok Welding Electrode Holders have everything the welder wants:

One Hand Operation • No "Rod Bonding" Fewer Parts • Current Runs Up Both Jaws Makes "Hard-to-Get Spots" Accessible No Coil Springs • Wider Jaw Gripping Area Lever in Line with Jaws • Spatter Guard Mechanism Completely Enclosed Fully Insulated • Interchangeable Jaws Parallel Jaws—Equal Gripping Pressure Better Conductivity • Easy Maintenance

You've never seen a more simple, trouble-free Holder. Greatly improved over conventional holders, proved easier to use, assuring faster welding with less fatigue. Write for complete details.

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BOOK REVIEWS

Welding Safety

SAFE PRACTICES FOR WELDING AND CUTTING CONTAINERS THAT HAVE HELD COMBUSTIBLES. Published by American Welding Society, New York, 1952. Paper, 6 x 9 in., 12 pages. Price 50c.

This revised standard, first published in 1940, reflects the best recommendations of safety engineers and experienced welding people and covers in detail the step-by-step procedures to take in preparing fuel or combustibles containers for welding or cutting. General precautions are enumerated as are specific cleaning methods (hot chemicals or steam).

Safety steps during actual welding or cutting are also described, for example, filling tanks with water or an inert gas. The appendix lists in detail gas testing apparatus for insuring that cleaned containers have truly been rendered safe.

There is no doubt about the need for care and know-how in dealing with combustibles containers. This standard will be a definite help toward safer welding operations in the refinery, chemicals and processing industries.

* * *

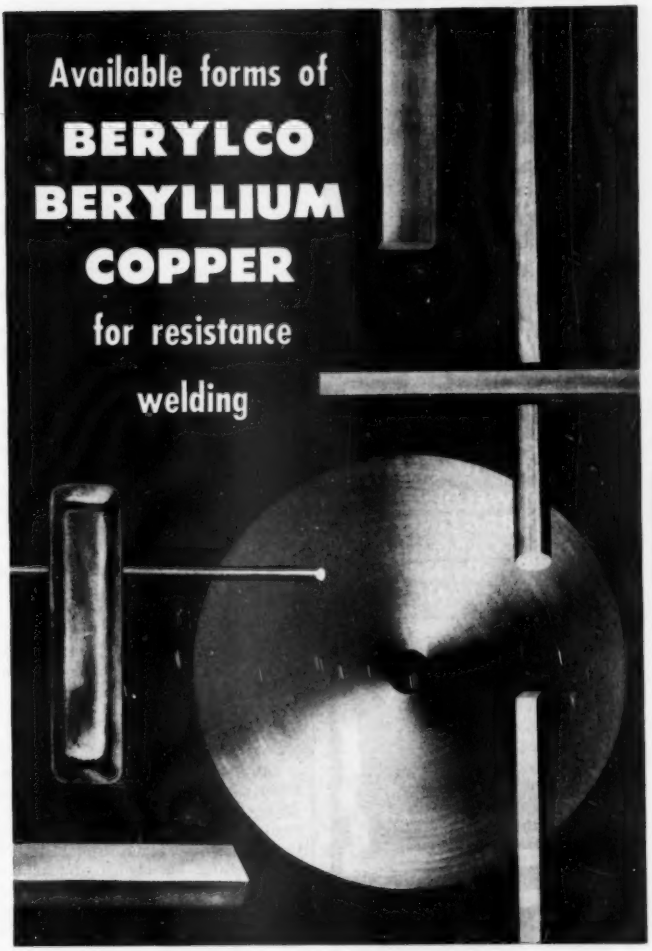
Management Ideas

INCENTIVE MANAGEMENT. By James F. Lincoln. Published by The Lincoln Electric Co., Cleveland, 1951. Cloth, 6 x 9 in., 280 pages. Price $1.

Incentive Management is much more than just a book on personnel relations. It is a combination of a philosophy of business, inspirational essays and interesting fact that explains successful incentive management. Jim Lincoln discloses the secret of his company's success in a concise manner when he writes: " . . . progress of mankind depends on human beings rather than machines, and all progress to date has been the direct result of some form of incentive."

His chapter on "security" should be compulsory reading for everyone in the country. From it we can learn that government has but one function, that of taking away, though some people continue to believe that government also gives. The privilege of reading this one chapter is well worth the entire purchase cost of the book and there are 13 others for extra value.

Readers of THE WELDING ENGINEER will be particularly interested in the appendix of *Incentive Management*. Here, welding equipment production statistics are given for most



You can buy Berylco in casting ingots. You can buy it as rod and bar, in rounds, rectangles, hexagons or squares. You can buy it as standard size seam welding wheels.

However you buy it, Berylco is an ideal resistance welding material, gives you properties not otherwise obtainable. To find out what Berylco can do for you, take advantage of the technical knowledge of the world's largest producer of beryllium copper. Blueprint your problem.

The Beryllium Copper TECHNICAL BULLETIN, issued monthly, is full of helpful information about end uses. To receive your copy regularly, write on your business letterhead.

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THE FORMULA
THAT ALWAYS MAKES GOOD

All-State

ALLOYS AND FLUXES
FOR WELDING
BRAZING
SOLDERING
TINNING
CUTTING

It's the formula that accounts for the high rate
• in application speed
• in uniformity
• in operator training
• in dependability
• in quality
which characterize the wide use of ALL-STATE Alloys and Fluxes

It's the formula we use continuously. Interpreted:
Mk-h — Metallurgical know-how
Pk-h — Practical know-how
Se — Service
Tr — Training
ED — Excellent Distributors

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ALL-STATE
WELDING ALLOYS CO., INC.
White Plains, N. Y.

of the major manufacturers. This includes data on electrode selling prices, welding machine selling prices, wages paid per employee and work produced per employee. These facts are interesting arguments for a successful incentive system.

Practically, this book points out concrete examples of problems in getting started on incentive management and discusses why some such systems fail. The functions of "piece work" as well as union-production ideas in incentive systems are covered. Responsibilities of management in making incentive plans work are clearly defined. An efficient and correct size for a business and how to finance it are treated in individual chapters.

As Mr. Lincoln aptly writes, the American system of free enterprise and competitive capitalism now stands at the crossroads. What happens depends largely on how well management handles itself. This bookful of management ideas merits the serious consideration of everyone in business —workers, unions and managers— who are concerned about our future.

* * *

Machine Illustrations

THE ENGINEER'S ILLUSTRATED THESAURUS. By Herbert Herkimer. Published by Chemical Publishing Co., New York, 1951. Cloth, 5½ x 8 in., 572 pages. Price $6.

For those who must work with or design machines and machinery, this is an excellent reference. More than 8,000 illustrations of machine elements and assembled machinery give the engineer, designer, draftsman and manufacturer his choice of machine parts and equipment most suitable for his particular purpose. The thesarus should also serve as an efficient guide for the student or the trainee.

Almost every conceivable type of machine element is clearly pictured and identified. Where necessary, an explanation of how it works is given.

Happily, much thought has gone into setting up the book in sections that aid the reader in finding information as quickly as possible. Sections have been compiled on such subjects as fasteners, adjusting devices, supports and structures, basic mechanical movements, elevators, cranes, derricks, conveyors, transmission of liquids and gases, combustion, prime movers, transportation, industrial processes, electrical appliances, heating, cooling and air conditioning.

An exhaustive index at the end of the book cross-references all the material presented, to provide an additional aid. This book is highly recommended for those people concerned with design problems.

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SATURDAY EVENING POST

When the job says
WELD IT!
be ready with
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Marquette is the welding equipment used by more and more shops and companies for both maintenance and production welding. Precision-engineered, compact, mobile, Marquette welders are recognized for their outstanding performance under difficult conditions. The Marquette line of electrodes and rods is justly famous for offering not only the right rod but the best rod for each kind of welding job. When the job says "Weld it"... be ready with Marquette!

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Computation Aids

GRAPHIC AIDS IN ENGINEERING COMPUTATION. By Raymond P. Hoelscher, Joseph N. Arnold and Stanley H. Pierce. Published by McGraw-Hill Book Co., New York, 1952. Cloth, 6 x 9 in., 197 pages. Price $4.50.

This new text covers a number of graphic and mechanical methods of computations that have not heretofore been assembled in a single volume. Students or engineers with such tools as architects' and engineers' scales and a knowledge of drawing, algebra, plane geometry and analytical geometry will be able to solve many puzzling problems in a satisfactory manner.

Chapters are included on the standard slide rule, the derivation of empirical equations from laboratory and field data, construction of nomographs by geometric methods with determinants, the construction of special slide rules and advanced work on movable scale charts.

For men who commonly work with mathematical problems, this book will be a useful text and a handy reference.

* * *

Machines

MANUFACTURING PROCESSES, Third Edition. By Myron L. Begeman. Published by John Wiley & Sons, Inc., New York, 1952. Cloth, 6 x 9 in., 608 pages. Price $6.

In the third edition of this well known book, Professor Begeman gives the reader detailed information on all the important manufacturing processes and machines now available, where they can best be applied, their advantages and drawbacks and tools required for each machine. While the information given on welding processes could be in greater detail, it is probably adequate for those engaged in production, industrial or tool engineering work.

The first half of the book is devoted to foundry practice, pattern work, plastic molding, powder metallurgy, hot and cold working of metal, heat treatment and welding. The second half covers measuring instruments, measuring tools, machines and accessories.

The chapter on welding has been completely rewritten and covers 45 pages. Subjects discussed in it are forge welding, resistance welding, gas welding, arc welding, thermit welding, cold welding, brazing, soldering, hard-facing and metal spraying.

* * *

If I have done the public any service, it is due to patient thought.—Isaac Newton

Tests on NEW Ranite "C-X" Rod prove savings to 66% over Tungsten carbide

Ranite "C-X", new formula hard-surfacing rod, has produced—in certain tests—an overlay as wear-resistant as Tungsten carbide tube rods—when properly applied. Ranite "C-X" should in many cases give equal surface protection at 1/3 the cost of Tungsten. In addition, Ranite rods, with their lower specific gravities, cover more area per pound than Tungsten.

Illustration gives graphic proof of Ranite claims. The picture clearly indicates that Ranite "C-X" was equal to the Tungsten Carbide rod.

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"C-X" produces a surface overlay which will exhibit outstanding wear resistance WHEN PROPERLY APPLIED. Preheating and slow cooling is recommended for best results. Deposits yield a minimum, if any, porosity, and will run 80% or better recovery of metal as overlay, plus assuring maximum service under highly abrasive conditions.

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30 YEARS AGO

(From THE WELDING ENGINEER of Mar., 1922)

PERSISTENCE in selling seems to pay off. The editors hear that a welding supply salesman recently jumped a high barbed wire fence to come in the back door of a welding shop. It seems the purchasing agent wouldn't let him in the front door, but he was convinced the shop needed his product and was willing to go to extra lengths (or heights).

—30 YEARS AGO—

BOOTLEG welding wire is apparently being sold to some concerns for genuine stock. Actually, it is baling wire or fence wire that gives welding a bad name when its weld deposit fails. It doesn't pay to save the few cents such products offer—standard brands of welding wire have the manufacturer's reputation backing them.

—30 YEARS AGO—

REPAIR by carbon arc welding of a bronze turbine runner at Yakima, Wash., saved the Pacific Power & Light Company there some $5,000. The firm of Drolet & Laurent did the welding.

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Use the ANZICK **SLIP-ON SOLDERING TIP**

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125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

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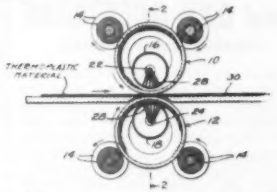
New York 11, N. Y.

From the Patent Office

Welding Method

2,575,251. ORIAN M. ARNOLD, Troy, N. Y. Filed Sept. 9, 1943. Granted Nov. 13, 1951.

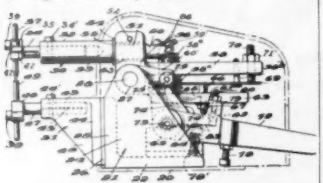


Patent pertains to a method of welding bodies of different composition, each of which embodies in its substance molecular units responsive to alternating electrostatic fields. Those units next to the surface of the bodies have an anomalous dispersion range with a different center frequency than corresponding range of units within the body. The welding comprises exposing the bodies, with surfaces in contact, to an alternating electrostatic field having one frequency near the center of the range of anomalous dispersion for molecular units at the surface of one of the bodies. The other frequency is near the center of the range of similar units in the other body of differing material.

* * *

Spot Welder

2,578,835. ALBERT F. PITYO, CLIFTON and HARRY E. BUTTERFIELD, JR., Maplewood, N. J. Filed Oct. 10, 1950. Granted Dec. 18, 1951.



This patented design for a spot welder has two electrode holders that move toward each other on two pivotally connected arms. An elongated leaf spring is arranged between the two arms and extends along their length. The free end of the leaf-spring bears against the first arm. The tension of the free end of the leaf spring can be adjusted.

The Passkey to TOP BRAZING PRODUCTION to BOTTOM BRAZING COSTS

EASY-FLO

■ If you need *more* joints per hour — if you need *better* joints — if you need to *cut costs* — you can open the doors to all three with EASY-FLO — the low-temperature silver brazing alloy.

You simply apply the 3-part EASY-FLO brazing formula — (1) *preplace* the alloy — (2) use a *fast* heating method — (3) devise a set-up that will keep assemblies on the move to and through the heating zone. Below is a typical example.

We'll be pleased to send a Field Engineer to your plant to help you apply the EASY-FLO formula to your brazing needs. *There's no cost or obligation* — so, why not get the benefit of this man's wide production brazing experience. Just contact our nearest office or dealer and say when you'd like him to call.

Typical Application of the Easy-Flo Brazing Formula

1. THE ASSEMBLY
A steel tube and a steel stamping with a ring of 3/64" EASY-FLO45 wire preplaced as at right.

2. THE FAST HEATING METHOD
In this case it's gas-air in 2 parallel rows of burners.

3. THE PRODUCTION SET-UP
A motor-driven endless chain which travels between the rows of burners. Operator assembles parts on jigs on the chain, preplaces the EASY-FLO rings and applies Handy Flux. Close-up shows construction. Chain speed is timed for proper heating. Finished assemblies drop off into quenching tank.

RESULTS
225 assemblies per hour, beautifully brazed — with the human element entirely eliminated from the actual heating and brazing.

See this set-up in action at the ASTE EXPOSITION—Chicago
It's an eye-opening demonstration of simplified production brazing . . . Also examine the many other examples of EASY-FLO brazed parts from defense and domestic production . . . And watch the carbide tipping of cutting tools by the fast and economical EASY-FLO brazing process . . . Discuss your metal joining problems with our experienced engineers —
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Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

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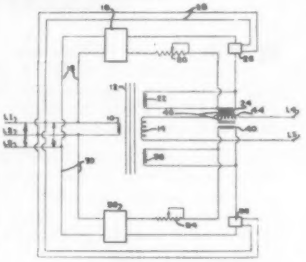
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 3" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

NCG

STOCKED and DISTRIBUTED BY NATIONAL CYLINDER GAS COMPANY

A-C Welder

2,577,258. FRANCIS B. MILLER, Dayton, O. Assigned to The Commonwealth Engineering Company of Ohio, Dayton. Filed June 13, 1946. Granted Dec. 4, 1951.



A newly patented a-c welder has a primary and secondary coil linked with a single closed magnetic circuit. A three phase power supply system has one phase of it connected to supply the primary coil. First and second auxiliary coils are positioned to be linked by the magnetic circuit. First and second filters are connected respectively to supply the first and second auxiliary coils. The first and second filter are supplied respectively by the second and third phases of the power supply circuit.

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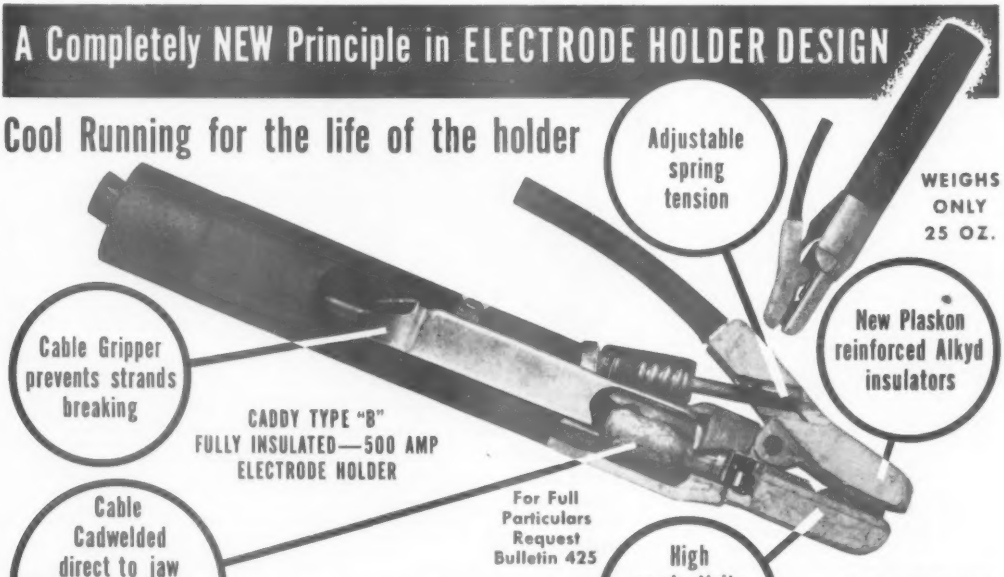

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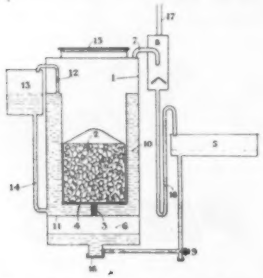
High conductivity replaceable copper jaw

"CADDY"

No mechanical connections — A solid copper circuit from welding machine to electrode

Acetylene Generator

2,581,871. AUGUST ADELIN GUSTAVE MAGIS, Paris, France. Filed Dec. 26, 1947. Granted Jan. 8, 1952.

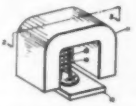


This French-designed acetylene generator has a closed chamber with a carbide holder in its lower part. The carbide holder has a solid bottom except for a narrow water supply duct in it. A water supply tank is connected to the duct. The sidewalls of the water supply extend upward with respect to the chamber a distance sufficient to provide a head of water adapted to act through the duct and balance the pressure of acetylene generated within the chamber. A gas outlet passageway leads from the upper part of the chamber. The gas passes into a condenser and from there into a gas supply conduit. A condensate conduit leads from the lower part of the condenser. It incorporates a U-tube-type pressure seal adapted to contain a column of condensate in balance with pressure of gas within the condenser. As the demand for acetylene ceases the acetylene pressure forces water out of contact with carbide in the holder and down through the narrow duct without blow-by of gas.

* * *

Welding Backup Device

2, 584,072. HERBERT E. WHITE, Cleveland Heights, O. Filed Nov. 29, 1947. Granted Jan. 29, 1952.



This patented device for welding or soldering thin sheet stock includes a horseshoe-shaped magnet. The two spaced apart legs end substantially in a plane. A backup plate is connected to the magnet between the two legs. The connection includes a spring normally biasing the backup plate to a location beyond the ends of the magnet legs.

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See Your Welding Supply Distributor
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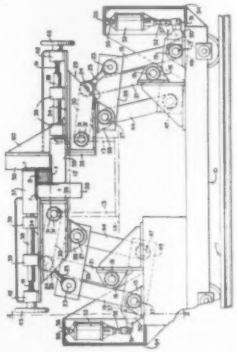
TWECO PRODUCTS
BOSTON at MOSLEY
WICHITA, KANSAS

Flame Scarfing Machine

2,575,080. JOSEPH M. TYRNER, Mendham Township, Morris County, N. J. Assigned to Air Reduction Co., Inc. Filed Aug. 3, 1949. Granted Nov. 13, 1951.

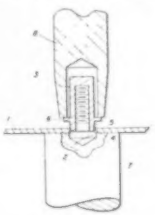


A newly patented scarfing machine flame scarfs the surfaces of billets and similar metal bodies. It includes a main support and means for obtaining relative movement between a billet and the support in a lengthwise direction. Two torch carriers have parts positioned at opposite sides of the path of travel. A scarfing torch is mounted on each carrier. Each torch has a set of orifices extending in at least two directions to direct a scarfing flame onto at least two adjacent sides of a billet. Means are provided for maintaining the torches in line in a direction at right angles to the path and for moving the torches toward and from the path.

• • •

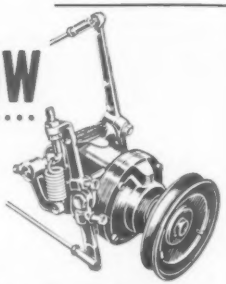
Resistance Welded Dome Nut

2,583,868. ANTHONY T. A. MOCIUN, Manhattan Beach, Calif. Assigned to North American Aviation, Inc. Filed Aug. 22, 1949. Granted Jan. 29, 1952.



This patent refers to a method for attaching a metallic dome nut to a metallic pressure vessel in pressure-tight relation. The dome nut, of fixed outside dimensions is press fitted into a hole of slightly smaller diameter in the pressure vessel. A welding current is passed through the press fit to fuse the metal around the circumference of the dome nut.

NOW . . . . . .



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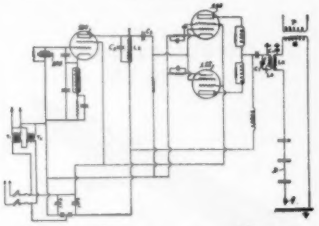
H-F Inert-Arc Welding

2,754,514. CHARLES L. VOLFF, Montreal, Quebec and JULIUS HAMMERSLAG, Outremont, Quebec, Canada. Assigned to L'Air Liquide Societe Anonyme. Filed April 25, 1949. Granted Nov. 13, 1951.

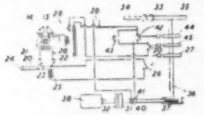


Patent refers to an arc welding apparatus including an electrode holder, a source of welding current and electronic means for furnishing continuous high frequency current to the holder. The electronic device includes a generator having a vacuum tube oscillator stabilized by a crystal and amplified by at least one amplification circuit fed to the welding circuit through a transformer. This electronic device is calibrated to produce h-f current in a band of frequency permissible for industrial apparatus. There are controls for tuning the entire electronic circuit including the oscillator, the welding circuit and the source of welding current. When the arc is struck a maximum power output is achieved next the holder.

* * *

Flash-Butt Welding Aluminum

2,583,455. LIONEL BRAY WILSON, Prescot, England. Assigned to Williams & Watson Ltd., Liverpool, England. Filed July 5, 1949. Granted Jan. 22, 1952.



This patent refers a method of resistance butt welding of aluminum of small cross sectional area. First, the ends of the components are flashed to make them uniform. The ends of the components are then brought into intimate contact with each other under light pressure while maintaining the application of welding current. The ends are kept together while welding current flows until the melting point of the metal is reached. When the metal melts sufficiently, the welding current circuit is broken. Immediately, the ends are brought together under heavy pressure, the welding current being off during the final consolidation of the joint.

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. . . AND YOU'LL SAVE UP TO 75% OF YOUR PRESENT COST OF ACETYLENE WITH THE VIRTUALLY AUTOMATIC

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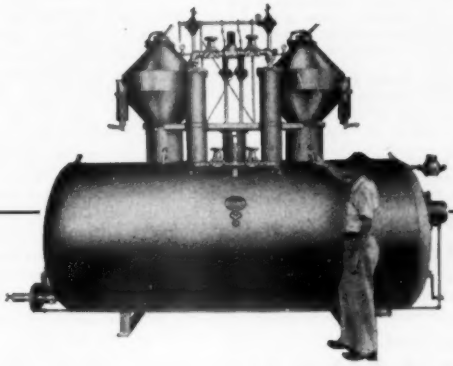
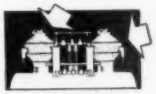
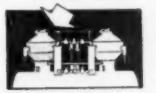


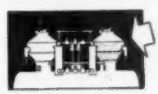
. . . AND THIS IS HOW



Two hoppers supply the carbide—each operates independently of the other. Start service by filling hoppers, simultaneously metering required amount of water into tank.



When hopper No. 1 is empty, meter fresh water into tank. Hopper No. 2 automatically goes into service. Automatic drain valve opens to release excess water and residue.



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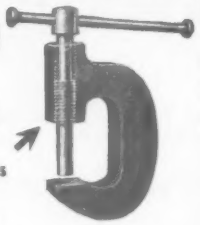

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2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

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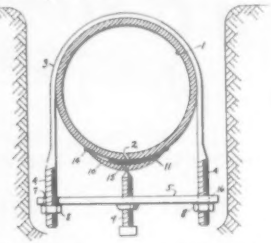
2,581,015. THOMAS T. GRAHAM, Houston, Tex. Filed March 4, 1946. Granted Jan. 1, 1952.



This repair clamp for pipelines has a yoke shaped to surround a pipe and has side arms having threaded ends. A tension bar has an opening in one end to receive one of the arms and has a side slot at its other end to receive the other arm. Retaining nuts on the arms hold the bar. A tension screw is threaded through the bar. A flexible concavo-convex metallic patch ends in thin edges. Against its convex side the screw is arranged to operate to hold the edges in engagement with the pipe in position to be welded to the pipe. A pocket is formed between the pipe and the concave side of the patch. A resilient pad is in the pocket on the concave side of the patch.

* * *

Alloying During Welding

2,583,163. RENE D. WASSERMAN New York City. Filed May 6, 1944. Granted Jan. 22, 1952.

This patent covers a welding or similar bonding process in which a base metal is to be surfaced with a weld metal. This process consists in supplying first a relatively thin layer of a bonding metal to the surface of the base metal. Upon the application of heat of a degree below the melting point of the base metal, at least one ingredient of the bonding metal will alloy itself with at least one constituent of the base metal. The ingredient of the bonding metal should have a high degree of affinity for the constituent in the base metal. This provides an intermediate alloy stratum having a melting point below that of the base metal and the bonding metal. Next, a weld metal is melted onto the alloy stratum to thereby bond the weld metal to the base metal with the alloy stratum positioned between them. Thereafter, a second type weld metal having a still higher melting point is applied to the first weld.

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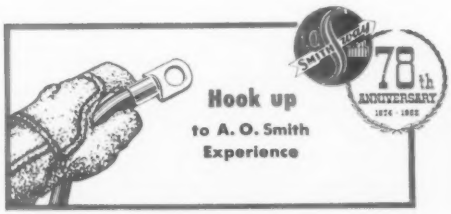

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